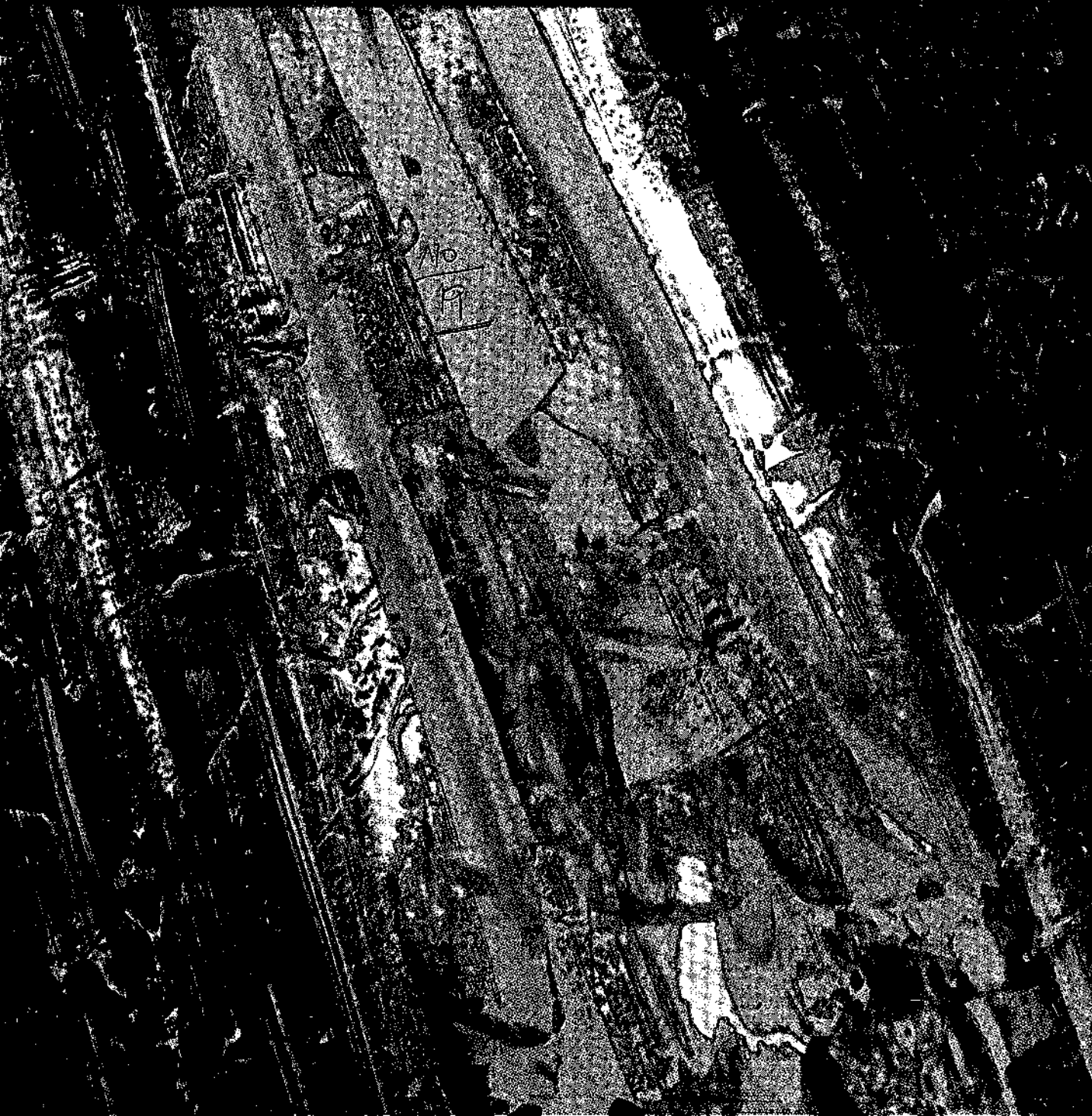


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This large factory for Associated Bearing Company Limited, manufacturers of SKF bearings, was constructed in a record time of 18 months—in precast reinforced concrete. Large column free working space was achieved by using high strength controlled concrete. The roof consists of reinforced foam concrete slabs to lighten dead loads and improve thermal insulation.

A special feature was the design and fabrication by ECC of cranes and gantries particularly suited for the project.

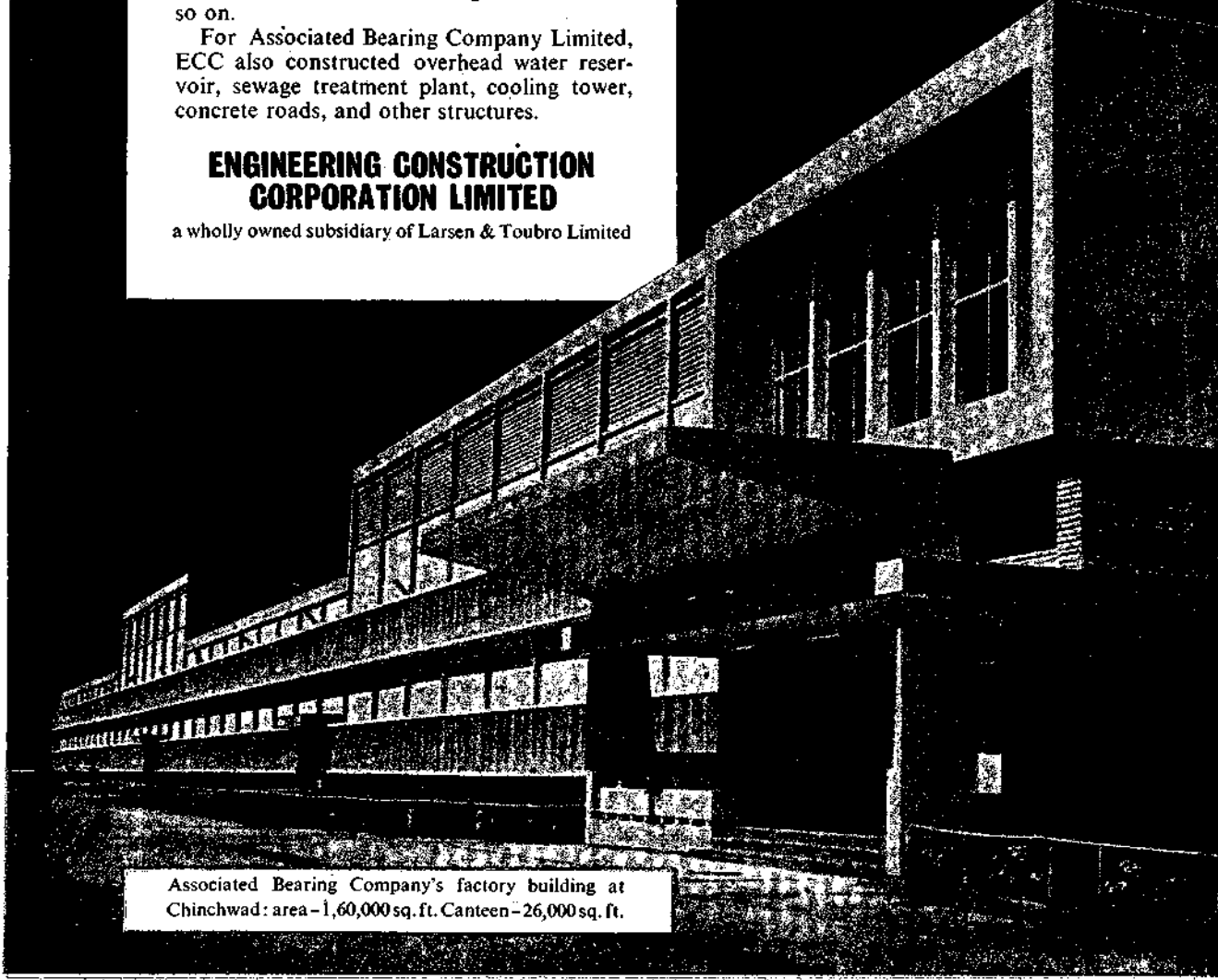
Executing this and many such jobs well within the schedule time has earned ECC a reputation for speed and excellence in the field of civil engineering contracting—a reputation spelt out in the design and construction of the Modular Laboratory at Trombay, the Weaving Shed for Madurai Mills at Ambasamudram, Indian Overseas Bank building at Madras and so on.

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Associated Bearing Company's factory building at Chinchwad: area—1,60,000 sq. ft. Canteen—26,000 sq. ft.

I am twenty...

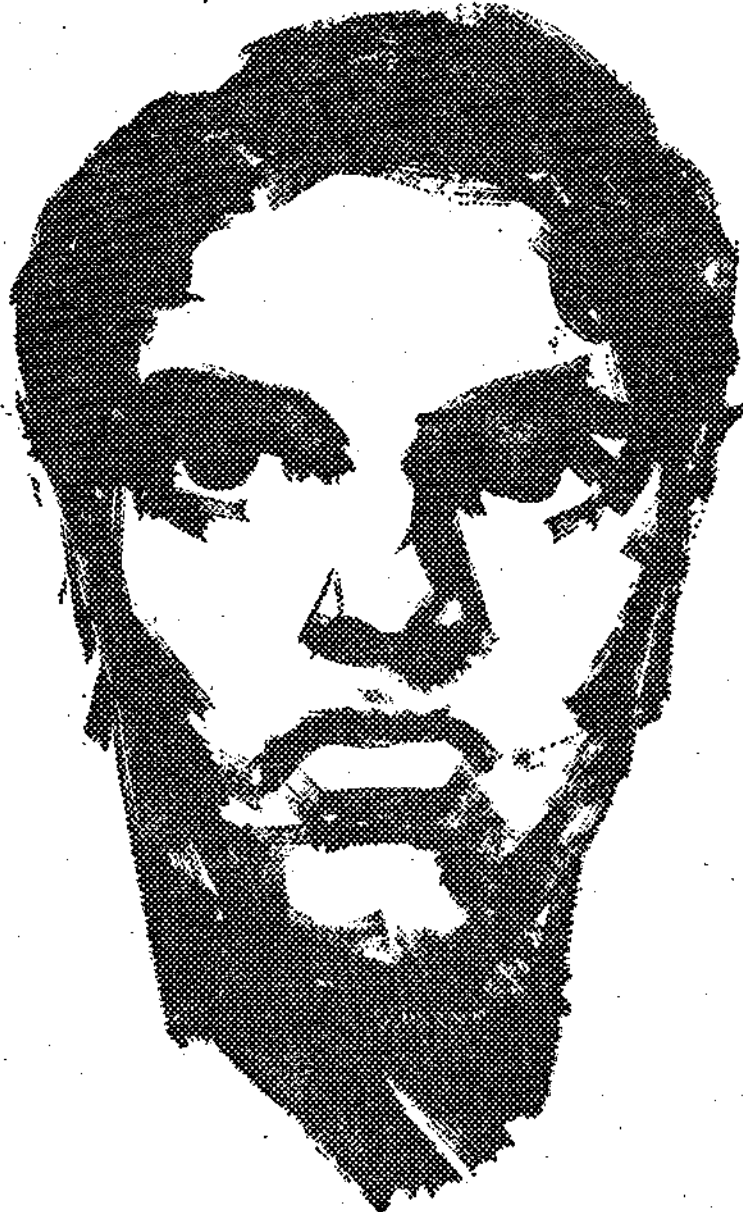
Born in free India, I have breathed freedom since birth. I have watched in breathless wonder the growth of the Nation, despite stresses and strains. I am aware of the challenge that faces the Nation—building anew in the face of odds.

But I am also aware that my country has a great tradition, rich and resilient. I am proud that today we produce jet planes and computers; twenty years ago we were dependent on imports even for pins and blades!

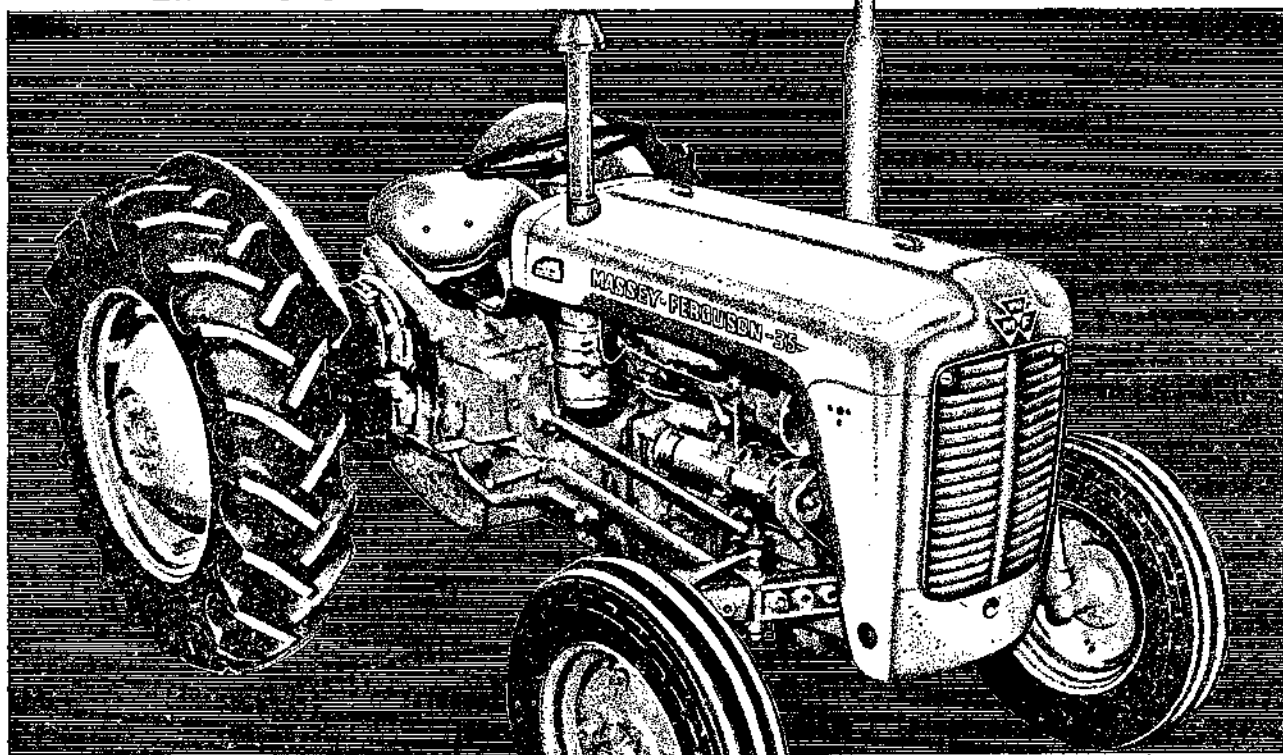
It is the Youth of today that will shape the future of this Nation, now pulsating with energy. I am confident.



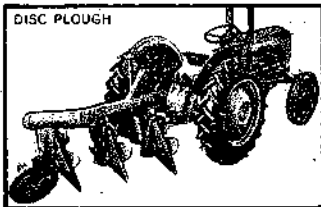
Confidence builds the nation



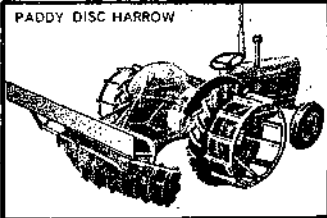
STAY FIRST WITH MASSEY-FERGUSON



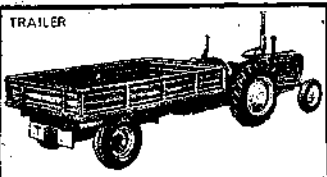
DISC PLOUGH



PADDY DISC HARROW



TRAILER



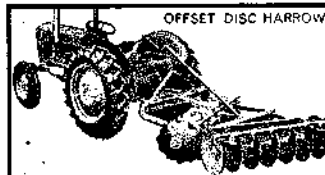
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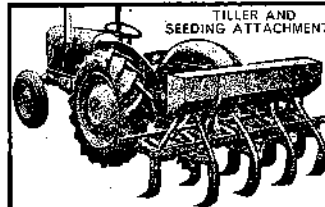


Tractors and Farm Equipment Limited
Madras

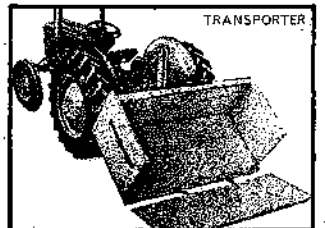
OFFSET DISC HARROW



TILLER AND
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TRANSPORTER



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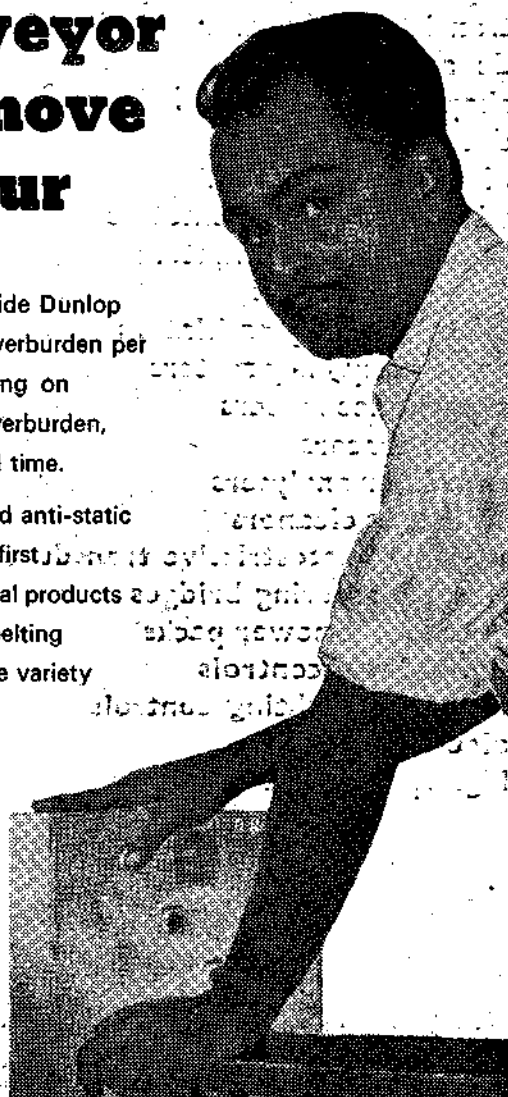
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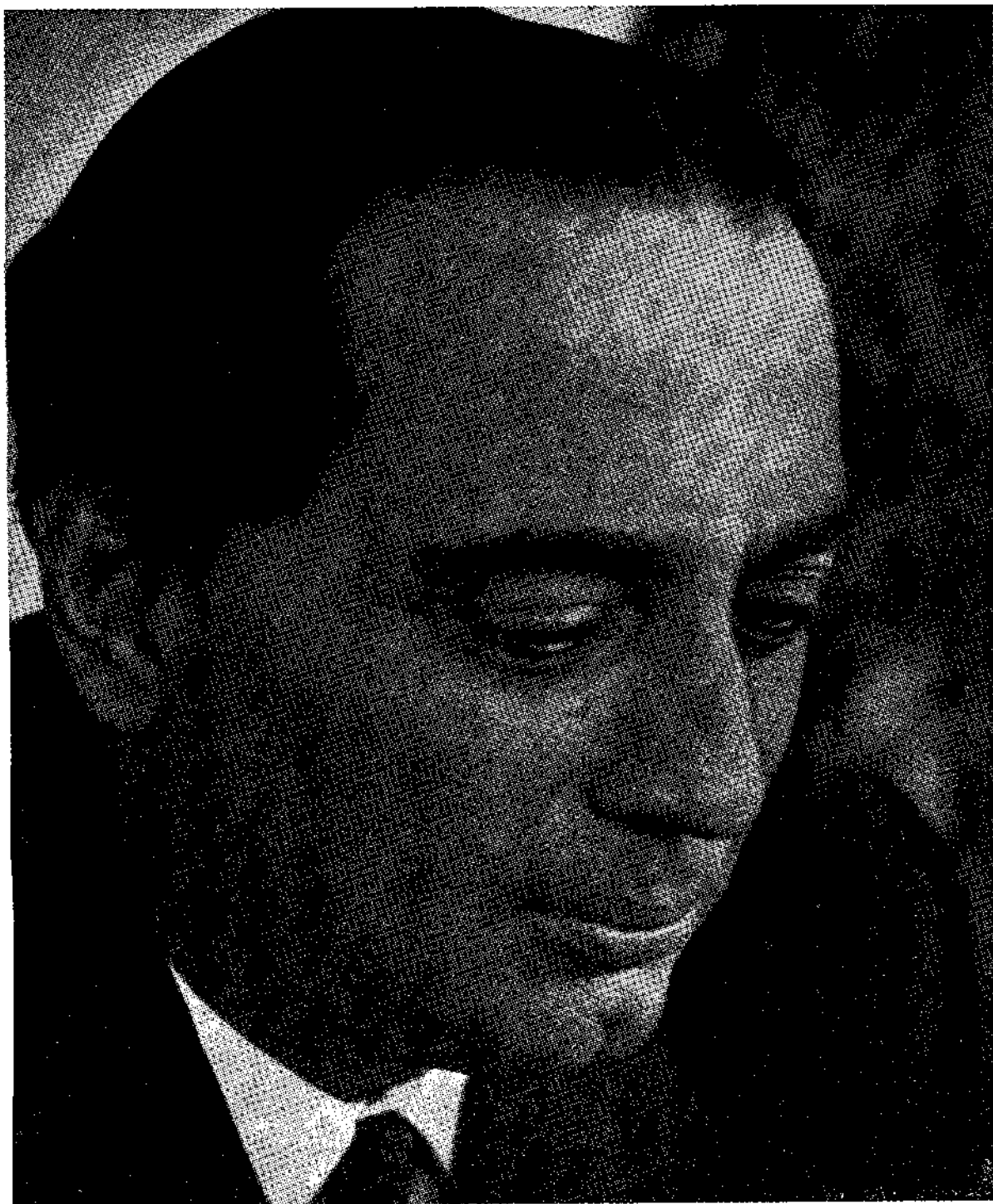
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“When nuclear energy has been successfully applied for power production, say a **couple of decades from now**, India will not have to look abroad for its experts but will find them ready at hand.”

—Dr. Bhabha (March 12, 1944)



Photograph : T.S. Nagarajan

SARABHAI
Talks to
YOJANA

“Even at the risk
of failure, we
must experiment with
our resources”

You can't have Twentieth Century Atomic Energy with Nineteenth Century Industry. It is a New Age. There is a Totality about it.

DR Vikram Sarabhai, Chairman of the Atomic Energy Commission, in an interview with *Yojana*, spoke of the management challenge in science institutions. He referred to two apparently antagonistic cultures, which, in fact, were complementary.

"At one end of the spectrum," he explained, "you have the administrators, acting on past precedents. They provide security and continuity, impersonalised to the extent that, if one person is substituted by another, everyone knows how the successor will work in a given set of circumstances. They are the preservers. At the other end, there are organisations based on research and development, involving individuals who act on insights and hunches, non-conformists questioning assumptions, innovating and learning."

"The right thing to do is to encourage the scientists in every possible way, so that they, in turn, will develop second generation scientists. More importantly, we should weave administrative practices around the scientists so that decision making, even in administrative matters, is left with the scientists."

Dr Sarabhai mentioned the underlying philosophy of the Max Planck Institutes in Germany. "That is", he said, "they do not build an institute and then seek out the suitable man but first pick up an outstanding man and then build an institute for him."

No Jarring Element

Dr. Bhabha, he pointed out, used to say that if there are no institutions to begin with and they grow around men, the management methods evolve harmoniously and

NEITHER MAGIC ...

"MANY people use science or technology as if it were a new magic. Philosophy is one thing, *Jadu* is another."

"In this nuclear age, there is no place for a blind acceptance of the 'magic' power without understanding the source of the power of science. Modern science has brought out constraints which should be understood."

"It is like the man in a community learning not to throw a stone where he pleases, as he might have done in a jungle. In our time a nation living in the nuclear world has to accept a self-discipline; there is no longer the freedom of settling disputes through the use of force on a grand scale; it has ceased to be meaningful."

...NOR FAIRY TALE

"THERE is this unhealthy trend to reduce science literature to some kind of fairy tale. This is not how the temper of science can be fostered. The vital thing is to spread understanding of the scientific method which is even more important than detailed factual learning."

"It is in the measure of a people's understanding of science and technology that a nation's development will be judged. The theory that a mere application of technology contributes to growth fails in practice. Technology must be applied through understanding."

"A significant number of citizens must understand the ways of modern science and of the technology that flows from it."

there will be little scope for the jarring element.

Dr Sarabhai cited the example of the Tata Institute where work on microbiology was not started until after 1962, though as early as 1944 Dr Bhabha had been urged to set up a branch for biophysics. When he agreed to the idea in 1962, it was only because the right man had been found; so, too, in radio astronomy.

"Thus", Dr Sarabhai pointed out, "institutions should grow on the ability of groups to expand fruitfully."

If India's achievement in nuclear research and technology is impressive, it owes not a little to the special kind of organisation that was created and to the scope given for self-reliant growth. Dr. Sarabhai said, "I see no reason why we cannot do as well in other fields as we have done in the sophisticated and complex area of atomic science—in fertilisers, steel, oil, petrochemicals or, for that matter, in most sectors of development."

"Indian expertise, if not available readily or in full measure, can be quickly built. Even at the risk of failure we must experiment with our own resources."

Asked about the returns to the country of atomic research, Dr. Sarabhai said, "You cannot measure these in terms of dividends alone. Not that a hard economic return should not be expected; nor is it that expenditure on science is not an investment. It certainly is. But I think there are two things we have to understand, the types of return and the time in which they occur."

There, certainly, was, in the case of nuclear investment, an immediate and substantial return. "We have made a comparison in the Gujarat area, the Madras region

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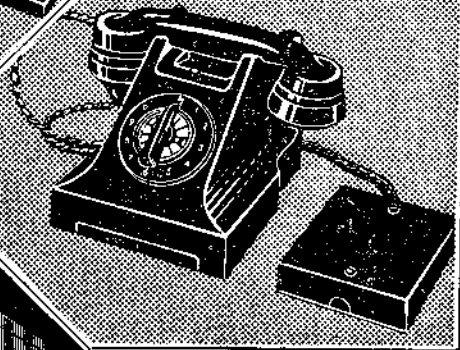
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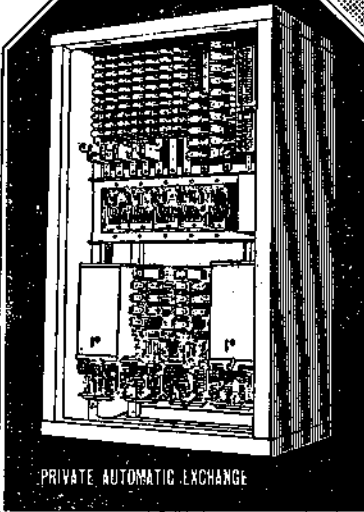
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"Institutions should grow on the ability of groups to expand fruitfully."

and in Rajasthan," he said. "Even after devaluation, which has some what put up the costs of nuclear-plants, the power from them will be cheaper if one takes every factor into account. And in certain cases, a combination of nuclear, thermal and hydel power will give the least cost solution."

But there was also the intangible and long-term aspect; and more than that there was a certain compulsion for a country aspiring to develop through the application of modern science and technology, just as the building of the railways was an inevitability a hundred years ago.

He explained that a new culture was evolving, a culture "where standards of efficiency, quality and tolerances are most exacting." Unless a country had intimate experience of the new type of discipline that this culture imposed, it could not hope to be anywhere in the race. "It is a new age. There is a totality about it."

This totality would be reflected in the kind of industrial activity developing around science. "You cannot have 20th century atomic energy with 19th century industry."

He said, "A nuclear plant will be a major breakthrough of a certain kind of industrial development—fertilisers, aluminium etc. In the process, the overall cost of fertilisers is very likely to go down."

"Is our nuclear research a prestige programme, as is made out by some?" we asked.

Creditable Achievement

Dr. Sarabhai replied, "It depends on how one looks at it. Certainly the achievement is creditable. It makes you proud of what our men have done. In that sense, it adds to national self-respect and it has become a prestige programme. But this idea of prestige was not in anybody's mind at all when the project was launched. The only objective was to help India's development."

Dr. Sarabhai was not thinking of a mad sinking of money into a

thing merely because it was good to have it whatever the economic benefit. His idea was that a reasonable share of national resources should go into this kind of research and experimentation.

That our nuclear research and atomic power programmes will greatly help our development is a fact few can contest. The practical benefits are immense; the intangible benefits are lasting and considerable and arise from the potential of technological and industrial development.

LANGUAGE

Positive incentives rather than negative constraints

"If there was a fellow who said he wanted to learn in Chinese, I would say all glory to him."

This answer to a question on instruction medium gives a clue to Dr. Sarabhai's way of going to the core of the matter. He said :

"I look upon a language as a means to an end, not an end in itself. If there was a fellow who said that he wanted to learn in Chinese I would say all glory to him. I feel that it is our duty to make available means of education in languages which are prevalent in the different areas. If a man wants to learn in Gujarati it is the duty of the State to make facilities available for learning. But if one wants to learn in English he should also be allowed to do so. The distinction is between permissive and compulsive systems."

Q. Creating facilities for learning in different languages would involve investment.

A. I don't mind investment. You should have positive incentives rather than negative constraints. In any event I don't think this is a central issue on which we have to break our heads and endanger national unity.

THIS IS CRAZY

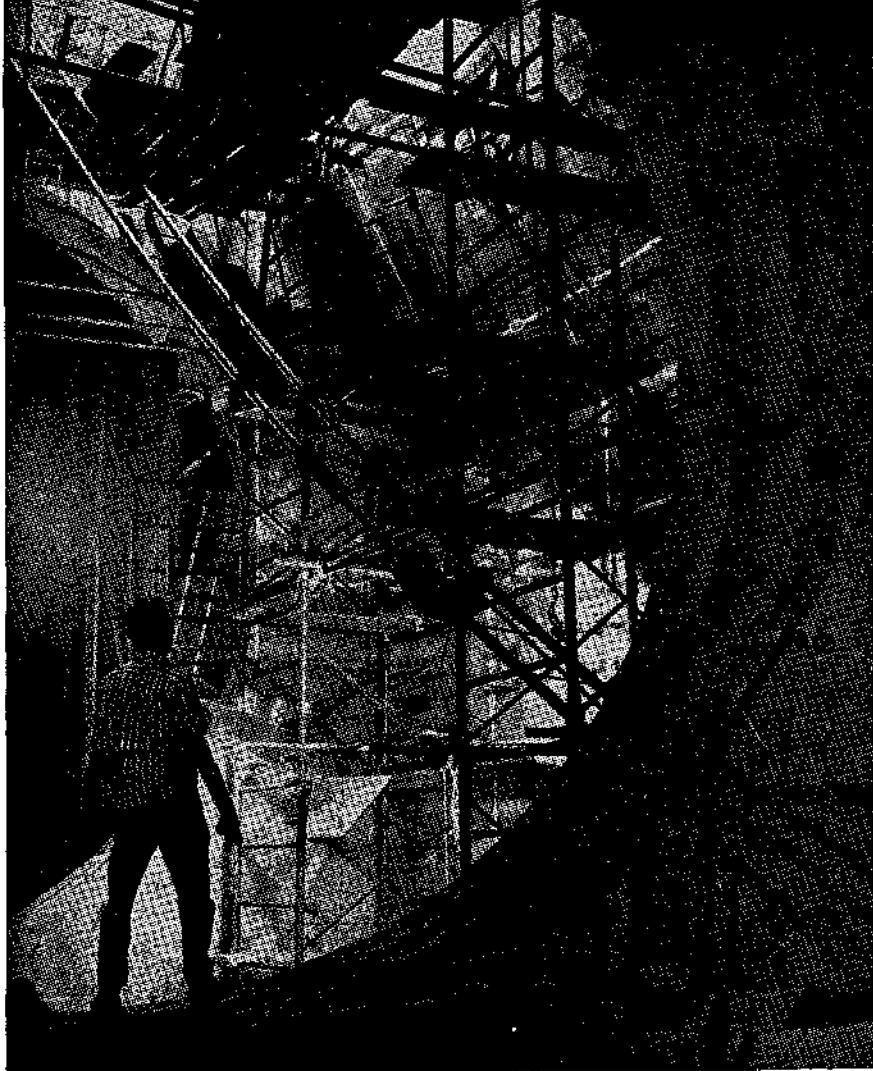
"THE role of the teacher is more crucial in science education than books or just about anything else. But the teacher, in many instances, gets less than a clerk. This is crazy."

"At Ahmedabad we have started a Group for the Improvement of Science Education. This Group consists of teachers from schools, colleges and research institutions and some gifted students. They are brought together by a personal motivation to improve understanding of science. They are ready to question, innovate and share experiences."

"There are not many interesting books on science in India, particularly in the languages. But there is nature around us which can be observed and analysed. As my friend Dr. Nag Chaudhuri will tell you, the measurement of physical features of people can be good material for science education."

Less than a Raman will do

"SCIENCE journalism must be fostered. The journalist need not be a Raman, but he must have a continuing and not a casual interest in science. In the U.S., I have seen science journalists at all kinds of science meetings even when they were not reporting. Of course, he must not yield to the temptation of making a tale or, as they say, build a story. There should not be the magical element in reporting science or technology."



A reactor in the making

Here is the future of India, the India of a certain devotion of spirit, of the search for truth in science, of getting out of the rut and the static conditions of the past.

— Jawaharlal Nehru

SPRINGBOARD FOR THE BIG LEAP

Report:

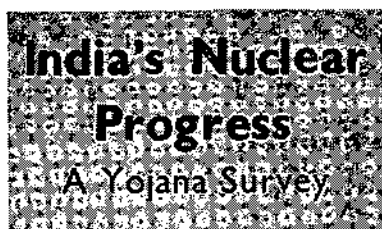
ROSSCOTE KRISHNA PILLAI

Photographs :

T.S. NAGARAJAN

Sketches :

R. SARANGAN



RETURNING in mid-August from a four-week tour of atomic energy and related projects scattered over a wide area we were asked how we felt.

We replied, "Our outstanding impression is of the young scientists at the various places we visited."

It is difficult not to be struck by the enthusiasm and energy of the growing band of young men who are the core and cream of India's science.

The visit to Kotah, Ahmedabad, Tarapur, Trombay, Kalpak-

THE SELF-RELIANT GROWTH

kam, Gauribidanur, Alwaye and Thumba was an escape as much from the oppressive heat of Delhi's July as from the creeping depression and weariness all round. It was a weird world into which we were stepping—weird in any circumstance but the more so in India's particular context. In these little clusters the men, mostly young, did not seem to know what it was to despair—and this in our land and at a time when despairing was so general and pervasive.

Not until we returned to the world to which we were used did we feel the impact of this journey into the unfamiliar regions of striving and hope. We had in those four weeks learnt to forget what we had earlier learnt to accept. For, in the "growing science" which is the world of Bhabha's men, nothing was beyond striving and little beyond achievement.

We knew, of course, that great things had been done and done very fast, but we certainly did not bargain for this unrelieved hope and confidence. Next to the Bhabha spell, this urge to achieve overwhelmed us.

This is just stating a fact. And if you are not convinced look at what they have done.

They have designed and built *Apsara*, India's first atomic reactor, two years before China's first reactor which was designed and built by the Soviet Union. It was they who pitchforked India into the select coterie of the first six countries in the world producing their own pure uranium fuel for their reactors. They built the Plutonium plant, a feat of scientific acumen and engineering skill. Electronics have been their forte; a huge variety of supersensitive electronic instruments and equipment, including computers, have come off their shelves. They blaze new trails not only in the fields of applied science but also in pure science. Many distant mysteries

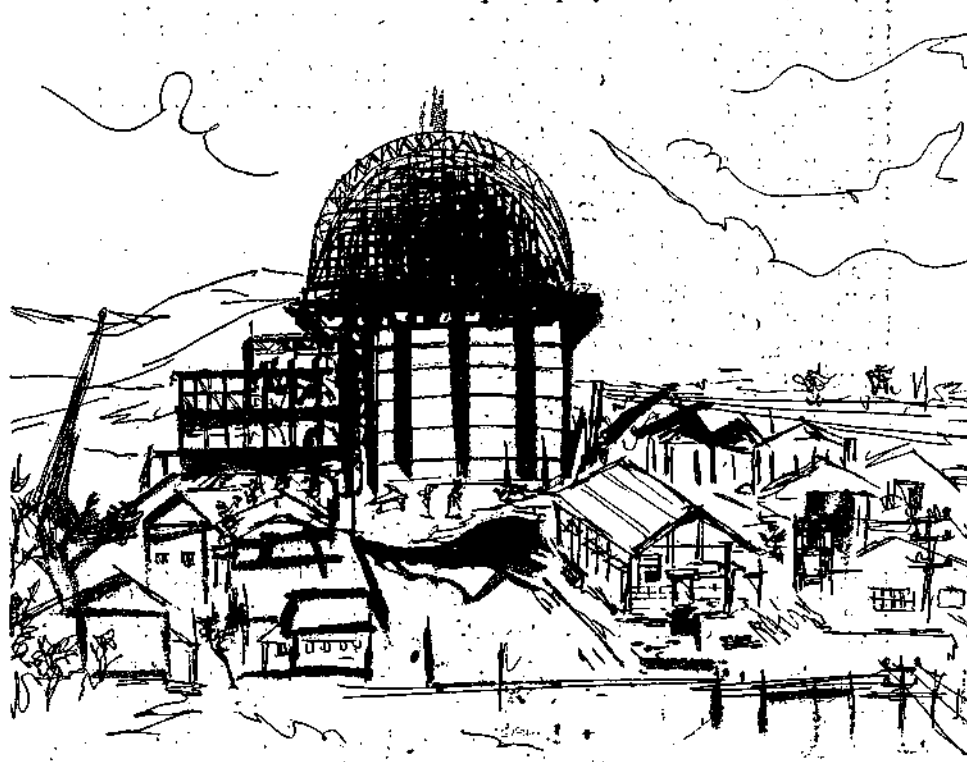
of the upper atmosphere and outer space have been unravelled by their probes. They will make their own rockets and rocket propellants for these studies.

In the near future they will design, construct and fuel the 400-MW Madras atomic power station at Kalpakkam. And so it was not with unjustifiable pride that Mr

33, and Professor of Theoretical Physics at the Indian Institute of Science, an idea was born. India should have a scientific institution devoted solely to fundamental research, especially in the newest branches of physics, namely nuclear physics and high energy physics.

He visualised an immediate

The Kotah power project



H. N. Sethna, the suave, young boss of the Bhabha Atomic Research Centre, said "In atomic research we are not underdeveloped."

India's shower of atomic successes has been no accidental fall-out. It has been a saga of long, ardent, painstaking devotion and pursuit of one man and his pick of comrades. About twenty five years ago, in the mind of young Bhabha, then

use for such an institute "in that it helps to train and develop, which no other mental discipline can, young men of high intellectual calibre in a society into people who can think about and analyse problems with a freshness of outlook and originality which is not generally found." And so on August 19, 1943 Dr Bhabha wrote to Mr J.R.D. Tata seeking his initiative in setting up such an institute.

"In Nuclear Research We Are

A year later : March 12, 1944. Dr Bhabha wrote to the Tata Trust, looking ahead, twenty years hence what, India would be in the world of nuclear achievement. That was more than a year before the first atomic bomb was exploded over Hiroshima and before nuclear physics had become what might be called 'the bandwagon' of science.

Fringe of Science

Indian atomics grew out of Bhabha's hand, and the Tata Institute of Fundamental Research was its nursery. The Institute picked tens and hundreds of brilliant young men and grew them into outstanding leaders of science "through a successive process of filtering" as Prof M.G.K. Menon, the bearded, handsome Director of the Institute, put it to me. From this centre of fundamental research in "the external fringes of science" branched off the Atomic Energy Establishment at Trombay, now known as the Bhabha Atomic Research Centre (B.A.R.C.), the largest science establishment in India with about 1,800 scientists, and engineers and about 2,500 technicians.

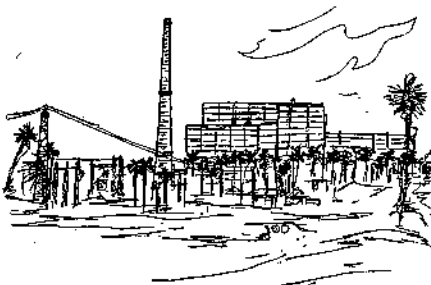
The Bhabha Research Centre's Physics Division and the Electronics Division, the strongest research and development group



in electronics in India, had their origin at the Tata Institute. There is interchange of scientific personnel between the Tata Institute and the B.A.R.C. and allied institutions—from pure to applied research and engineering, and back to pure research, thereby keeping afresh the spirit of enquiry. Thus in the course of two decades, on the strong base which Dr Bhabha laid has risen the superstructure of India's nuclear science, a symbol of self-reliance.

Orderly Evolution

From the Tata Institute through Trombay to the three atomic power



stations—Tarapur, Rana Pratap Sagar and Kalpakkam—has been an orderly evolution of India's atomic energy programme wedded to a twin objective of harnessing the energy as a source of electricity and of producing radioactive isotopes for use in agriculture, industry, biology and medicine.

How do we compare in the nuclear field with the 'advanced' countries? Before India started on her research programme in a big way, there were three nuclear powers: the U.S.A., the U.K. and the U.S.S.R. They had made the bomb and none other. Spectacular as their success had been, progress in peaceful uses of nuclear energy was so meagre that only last year Prof. Edward Teller, father of U.S.A.'s H-Bomb, wrote in the Bulletin of the Atomic Scientists that in his own country "nuclear

explosives have been developed with some success for military applications, but the challenging and hopeful field of peaceful applications was neglected up to the year 1957. Since that time some progress has been made, but we are not moving at a sufficient speed."

In the U.K. there was emphasis on nuclear power and on production of isotopes. She was the first to build a nuclear power station at Calder Hall in 1956. Yet, Sir William Penney, Chairman of the U.K. Atomic Energy Authority, said four months ago: "Nuclear power is still in its early stages of development."

The first three nuclear powers—the U.S.A., the U.S.S.R. and the U.K.—provide a frame of comparison as well as contrast with India. To these, in recent years, has been added China, whose successes have led to some animation in India. China, like India, is an Asian country; and a hostile neighbour besides. Comparison is, therefore, a natural temptation.

Speed of Progress

Between the older nuclear powers and the emerging ones on the one side and India on the other, the difference is obvious. They have the bomb; we haven't. This says little. Indian nuclear advance had been determined from the start by a voluntary discipline not to make the bomb. Yet it has been widely recognised for long that India could make one if she wanted. When the plutonium plant was built, many abroad were taken aback by the speed of India's nuclear advance. There was even some fear in other countries, so that Jawaharlal Nehru had to affirm again India's steadfast purpose.

To this progress Dr Bhabha modestly referred in a tribute to Nehru in June 1964. "Under his guidance," he said, "Indian atomic energy programme has to this day no military component, *whereas it could easily have had a sizeable one.*"

Not Underdeveloped?"

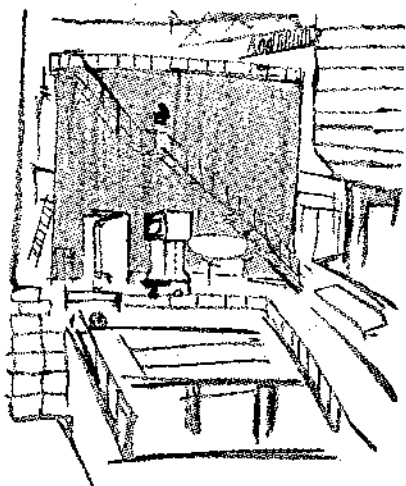
The bomb, certainly, is not a measure of a country's nuclear achievement or potential. What then is? And where do we base our claim to pre-eminence in this field?

The answer has been obvious to the rest of the world, and is obvious even to those in this country who would swear by the bomb. For one thing, thanks to Dr Bhabha's initiative, energy and example, a very large number of men, whom I would call 'Bhabha boys', have grown to acquire mastery over the theory and practice of nuclear physics.

We did not allow our self-reliance to shackle our manoeuvrability; on the other hand, knowing that we could do what others had already done, we just decided, as part of normal exchange of knowledge and experience, to profit from others only to the extent of speeding up our progress.

Important Distinction

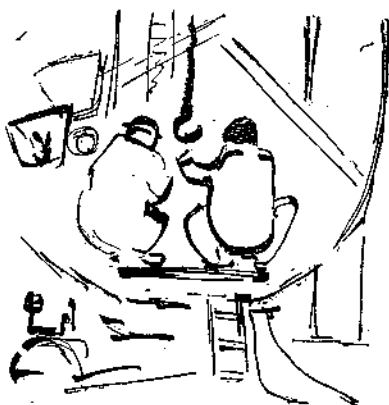
The distinction is important, because it emphasises our own advance. We are already poised for a breakthrough in the harnessing of the atom for a big programme of peaceful use. This implies everything—from fundamental research to applied technology. In isotopes, India is making good progress.



says

H.N. Sethna

The impressive advance in nuclear research and technology, the speed with which we reached the stage of plutonium separation and the pioneering work in isotopes speak their story. Resolute self-reliance adds to the merit of performance. That, despite evident capacity, we have consciously



denied ourselves the prestige of a bomb lends a distinctiveness to our nuclear advance.

Limited Resources

There is, however, one circumstance which has not been and cannot be sufficiently emphasised. This is the ratio between resources and achievement. While Dr Bhabha's enthusiasm and Nehru's support had assured a modest share of national resources for nuclear development, it was necessarily meagre.

India's nuclear progress has been made in an environment of relative technological and industrial backwardness; and within the



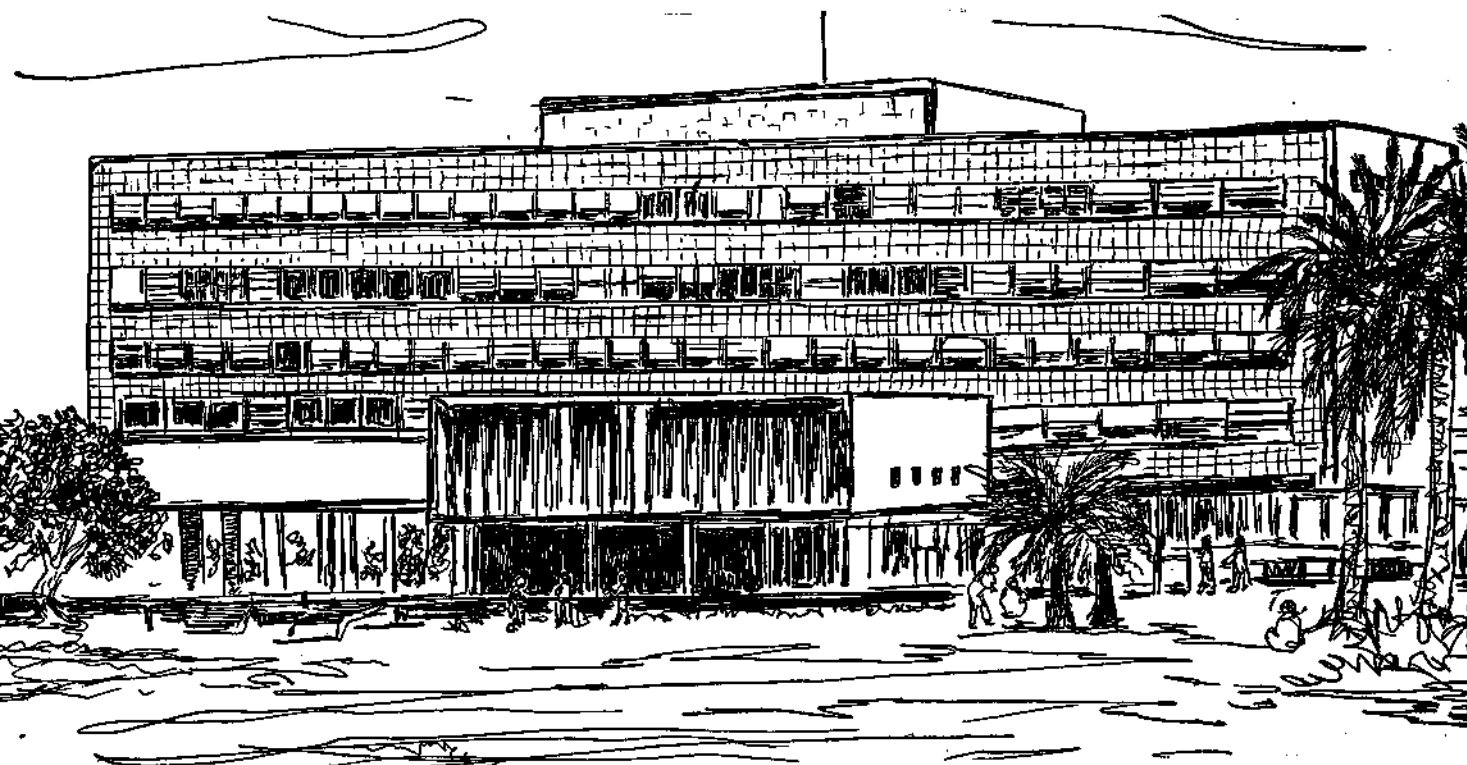
limitation of resources. The progress has been such as to enthuse the men of Trombay, Dr R. Ramanna, the Director of its Physics Division, for instance, to say that we don't have to depend on others "for either designing, building or working any of our future reactors or related installations."

Atomic power is a real symbol of the modern world which, Janus-like, faces two ways, the way of vast destruction and annihilation and the way of great speed in construction and progress.

So far as we are concerned, we are determined not to go in for making atom bombs and the like. But we are equally determined not to be left behind in the advance in the use of this new power.

The work the Atomic Energy Department has done and is doing is to pick out young, able scientists and to provide them the requisite training and experience. In this way the Department has built up a very fine set of young scientists. In fact, I remember that some eminent foreign scientists have referred to this. When they go to Trombay, one of the remarks they make almost invariably is about the young men in the Atomic Energy Department occupying very responsible positions. I wish in other departments of our activity also we could have young men in similar positions.

JAWAHARLAL NEHRU



THE HOUSE THAT BHABHA BUILT

HOW did India reach the vanguard of the world's nuclear achievement?

The clue to this success is to be found in that memorable letter of Dr. Bhabha to the Tata Trust in March 1944. Thus was born one of India's foremost institutions—the Tata Institute of Fundamental Research, the cradle of India's growing science. Here was pioneering work done, and like all pioneers, the men of the Institute built confidence upon confidence. Here was mad adventure, a sense of doing, of outpacing others and of remaining at the top. This process itself generates new energies and enthusiasms, which Dr. Ramanna, in his modest language, explained thus: "In the process, we have provided ourselves with a strong base for research in various branches of the fundamental sciences such as physics, chemistry, physical metallurgy, electronics and biology."

Dr. Ramanna himself came

from the Tata Institute, as indeed most of the key men in India's nuclear programme. If one were to tell the fascinating story of progress in nuclear development, one would have to start from the Tata Institute, which has been deservedly recognised as the National Centre of Advanced Study and Fundamental Research in Nuclear Science and Mathematics.

The Institute is a monument to Dr. Bhabha's sense of setting. The building rises in lonely splendour on the shores of the sea whose waters wash the campus. Functionally efficient and delightfully designed, it houses not the laboratories alone but selected works of art, some two hundred paintings among them.

The Institute, founded in June 1945, has been in existence for 22

FOUNDATION OF NUCLEAR EDIFICE

years. We learnt from Professor M. G. K. Menon, the present Director of the Institute, that the total expenditure over this period has been of the order of twelve crores of rupees. This is not a large expenditure by any standards in the world for what one has got in return. "And about half of this is there in the form of capital assets", he added. Professor Menon, evidently, has acquired some of Dr. Bhabha's assurance and pride of public relations. Inviting us to "see whatever you want" and "to go wherever you want to go in the Institute", he said, "you can talk to any scientist or technician you want, ask them any questions you like. You make your own assessment and publish it."

Most of the scientists are below 40. Their concern primarily is with fundamental research on the behaviour and structure of the physical world. The delicate and sophisticated instruments are mostly made at the Institute. Some of them one comes across in India only at the Institute: for example, the largest multiplate cloud chamber in the world for studying cosmic ray phenomena, the biggest electronic computer in India, operated and maintained entirely by the Institute's staff and available as a national facility, the first electronic digital computer built in India, 'TIFRAC', an 'on-line' computer designed completely and under fabrication in the Institute and a 3.5 MeV electron linear accelerator built in the Institute.

Among the scientists we saw were Dr. M.N. Joshi, who worked for four years in the Paris Observatory, and Mr. N.V.G. Sharma who was a student at Leiden University at the Hague. Here is their testimony: "As far as the scope for work and facilities are concerned, we are happy. This Ins-

titute is as good as any in Europe. Red tape has no place here."

"We are designing and constructing one of the largest radio-telescopes in the world and what you see here is part of that activity", said Dr. G. Swarup (38), Associate Professor in Radioastronomy. "It will be of huge size, 500 metres long and about 35 metres wide. We expect to finish it by October 1968. All the structural, mechanical and electronic parts of the telescope as well as its design is indigenous."

The Institute has been studying radio emission from the sun for a few years now. (An ordinary optical telescope catches light rays from the sun and the distant stars whilst a radio telescope catches radio waves emitted by these objects.)

With the help of a high-resolution solar radio interferometer—a kind of radio telescope—consisting of 32 parabolic (curved) dishes, installed over two years ago at Kalyan, near Bombay, the radioastronomers of the Tata Institute have been studying radio waves from the sun. "This instrument is not sensitive enough to study the radio waves from distant stars", said Dr. Swarup. "We know from a study of radiowaves that violent events have taken place in the stellar world. We are building the giant radiotelescope with a very large gathering power to study such phenomena which are of great astro-physical interest."

This radio telescope will be installed on the north-south slope of a hill near Ootacamund in South India whose axis is parallel to the earth's axis of rotation. "We found only in Ooty a few hills which have such slopes."

Has this kind of research any application? "Well, immediately, no", said Dr. Swarup. "But there are several important offshoots of this work. We are designing sophisticated electronic instruments such as extremely sensitive receivers. A man who had gained experience in this line by working with us a few years resigned and opened his own workshop. We like that to happen. It is good,

although it may be a temporary loss for us."

The Tata Institute has impressively contributed to the study of cosmic rays. Particles in cosmic rays have energies up to a billion billion electron volts and more. The Institute developed a method for the first time in the world of using stripped emulsion stacks and, as a result, discovered a particle called the negative K meson, a negatively charged particle of a mass thousand times that of the electron.

To study cosmic ray phenomena at 30,000 metres and above,



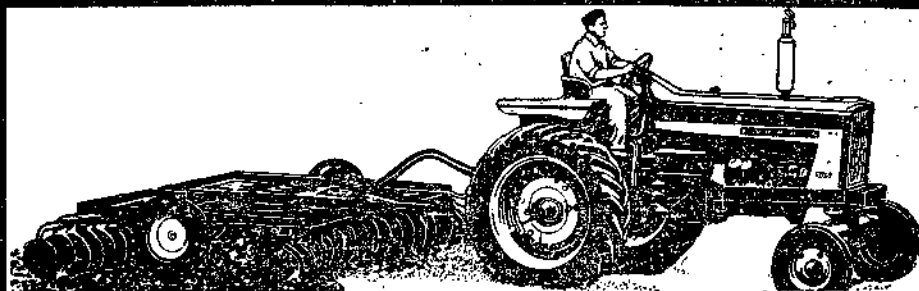
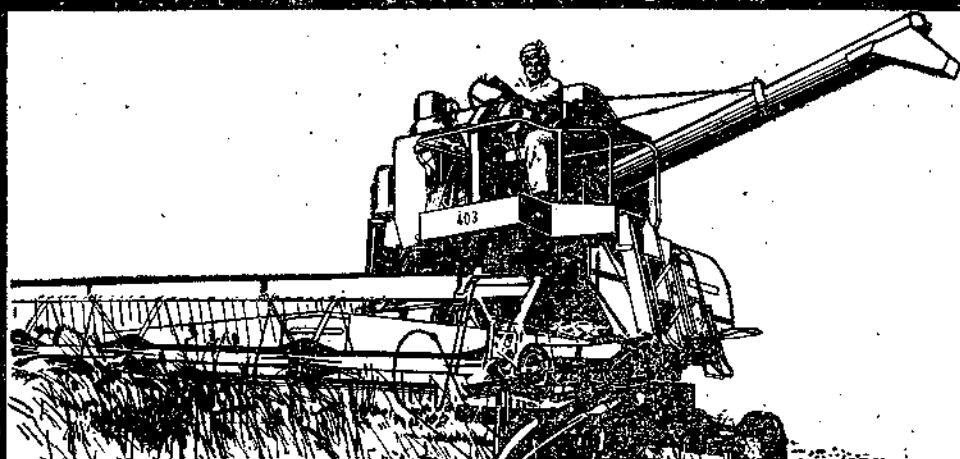
Prof. M.G.K. Menon, Director, Tata Institute of Fundamental Research

huge plastic balloons carrying special equipment have to be flown. The Tata Institute has an internationally recognised Balloon Flight Group to carry out this programme.

Ordinary polyethelene becomes brittle and splinters like glass at low temperatures found at great heights over the equatorial atmosphere.

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They Scan the Skies, Delve into the Seas

Prof. Menon and his group have evolved a special kind of polyethylene film mixed with fine carbon powder which can survive these temperatures. Balloons made of this plastic, of a 100,000 cubic metres in volume, have been used for high altitude studies both in India and abroad.

Broad Spectrum

Fundamental investigations on cosmic rays provide a broad spectrum of study of the physical world. Scanning the skies and delving into the seas have to go side by side. To explain :

Cosmic rays from outer space enter the top of the atmosphere and collide with atoms there. The result is the transformation of many naturally occurring elements into their radioactive 'step-brothers' called isotopes. Thus we have natural carbon-12 and radioactive carbon-14, produced by cosmic rays.

Most of these isotopes do not live long ; some, of course, do, but not for ever. While Phosphorus-33 has a 'half-life' of 25 days and Sulphur -35 of 87 days, Carbon-14 lives for 5,730 years and Beryllium 10 for 2.5 million years. These isotopes produced by cosmic ray collision are present in the atmosphere and are washed down by rain and snow. Thus they reach the waters of the ocean and get embedded in the sediment at the ocean bottom. By analysing the isotope content, especially of those like beryllium in the sediment we can get a record of all the geological events that occurred thousands of years ago. The isotopes also help in studying our environment—to find out how much mixing of water takes place in the oceans and how quickly ; how much of ground water is there at a particular place and how old ; the nature and amount of atmospheric circulation ; where the monsoon wind comes from and so on.

Till a dozen years ago only two radioisotopes were known in nature, one of carbon and the other of hydrogen called tritium. "We know today about two dozen

Impressive Study of Cosmic Phenomena

cosmic ray-produced radioisotopes out of which 10 have been detected by us," said Professor D. Lal of the Geophysics Group. Dr. Lal, at 38, is one of the oldest members of the Institute. He seemed as much at home with explaining to a layman as with his isotopes.

A Philosophy for Men

In pure research the subjects of investigation did not seem to have any apparent relation to one another. What have radioastronomy and cosmic ray studies to do with the structure of the nucleus, molecular biology or pure mathe-

matics ? Nothing much, except that all these belong to "the fringe of science." The philosophy in the building up of these different branches has been "to pick up an outstanding man and then build an institute for him."

The School of Mathematics is internationally known. The subject is such that, as Prof. K.G. Ramanathan and his associates explained, "No work is done here with a view to application." Not that practical value is rejected, but it is not the purpose. "It is an intellectual pursuit like music." The Professor thought this explanation should be sufficient.

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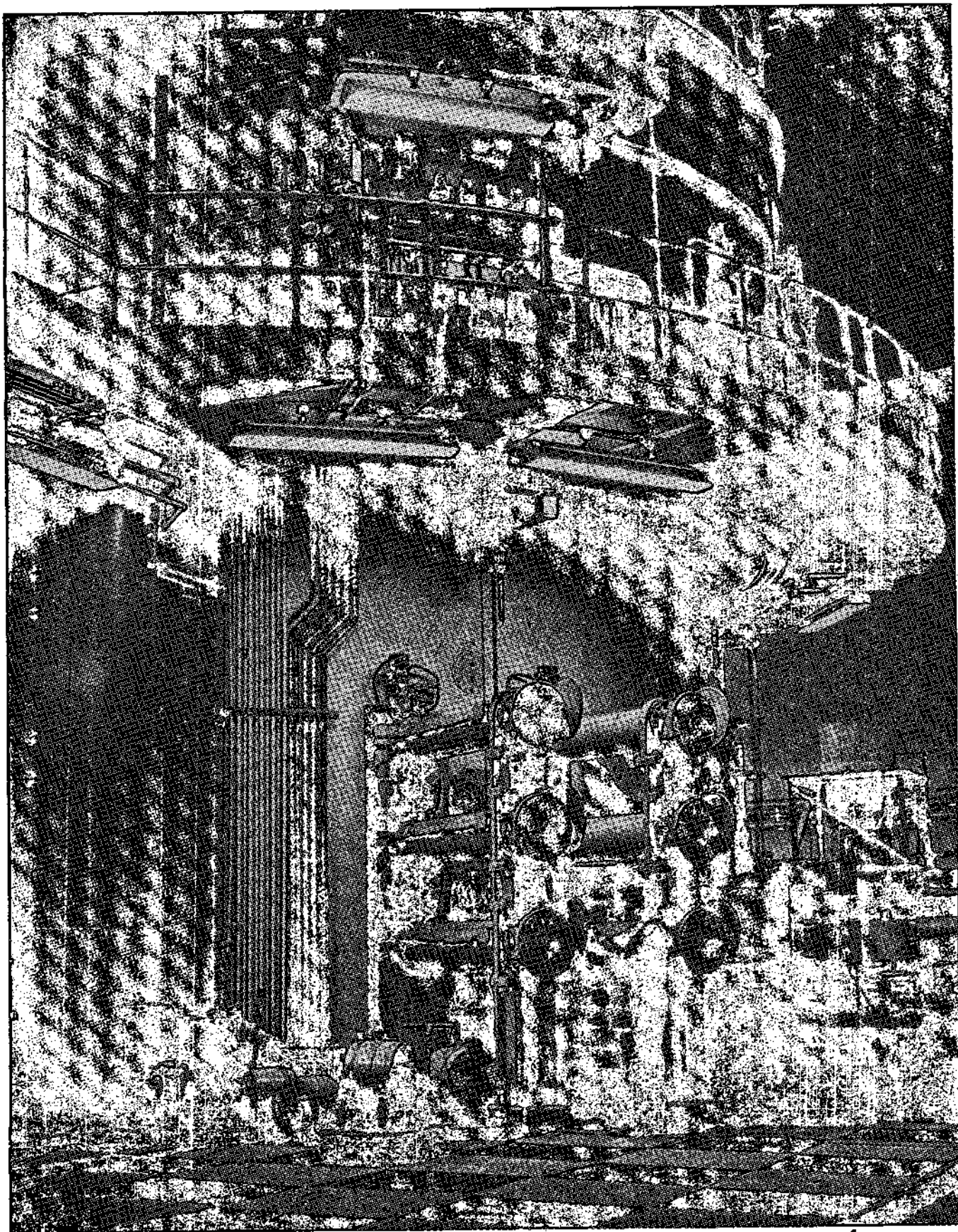
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The
Beneficent
Atom

The CIRUS Reactor which, besides helping in several studies, produces a wide range of radioisotopes

From The
Institute
To
Trombay

PROJECT OF PEACE

From the electronics and physics groups of the Tata Institute has grown the giant complex at Trombay now known as the *Bhabha Atomic Research Centre* devoted to peace.

Here at the Centre are housed the research reactors—Apsara, Cirus and Zerlina—the Uranium and Plutonium plants, the Fuel Element Fabrication Facility, the Isotope Division and the sprawling Electronics Division.

The B. A. R. C. like the Tata Institute has the Bhabha touch all over—in the setting, location, its layout, its structure and even in the hundreds of machines and instruments. Unlike the Tata Institute which is in the very centre of Bombay, the B.A.R.C. is securely 24 kilometers away from the city's mad rush. Around it are tiny hillocks, green and elegant. The sea is here too as at the Institute. But for the regulations, stern and austere, it could be an ideal picnic spot.

The Atomic Energy Establishment at Trombay (now B.A.R.C.) was born in 1954 with Dr Bhabha as its Director. Dr Bhabha keenly felt the need to bring together at a common centre the increasing activities in the manifold disciplines of science, relating to atomic energy, that were being actively pursued in the already overworked Tata Institute and other laboratories in Bombay. The Centre, dominated by the much photographed dome of the Cirus reactor, is a monument to the foresight, organising-genius, energy and sense of assurance of its founder and father.

A Milestone

"Here is Apsara", our guide told us. The first milestone in India's journey into the atomic age. Apsara! What a name to be

BIRTH OF A YOUNG IDEA

given to an atomic reactor, I thought.

Standing in the midst of a large hall, Apsara looks like a small metallic hut. After a look at the giant-sized reactors that are coming up at Tarapur and Rana Pratap Sagar, Apsara made little visual impact on me. But Apsara is history—the first success of India's nuclear effort. And perhaps, but for Apsara, the other reactors would have taken longer to be born. It was designed and built entirely by the B.A.R.C. scientists and engineers in just over a year. The fuel elements containing enriched uranium were leased by the U.K. Atomic Energy Authority.

Apsara's significance is that it immediately put India in the vanguard of world nuclear research. This was a big shot in the arm of Indian atomic science and its pioneers.

There are several types of reactors. Apsara is one of the simplest. It is called 'swimming pool' type, because the core of the reactor is suspended in a water-tank at a depth of 22 feet below the water surface. The core consists of enriched uranium fuel made up of plates of uranium-aluminium alloy encased in aluminium. Each charge of the enriched uranium fuel, that is natural uranium containing a large quantity of uranium 235, obtained from the U. K., works for eight to ten years. The first charge for Apsara containing 46% of uranium 235 was got in 1956 and the second containing 80% U 235 in 1965.

Towards Take-off

When the reactor is in operation, the core emits intense radiation which is shielded by water and by the walls of the tank made of 8½ feet thick concrete. The reactor is mainly intended as a research facility. It has been used to produce radioisotopes, to irradiate biological samples, to test various types of instruments for use in radiation work and also for fundamental research in nuclear physics. Radioisotopes of phos-

phorus, iodine and gold have been supplied to medical and agricultural research institutions. A number of new strains of rice, wheat and mango have been developed by irradiating their seeds in this reactor. Apsara proved to be a springboard for the country's leap forward in atomic engineering.

The Dome That Dominates

From Apsara to CIRUS (earlier known as C.I.R. or the Canada-India reactor) was, to me, like moving from a modest dwelling to a great mansion. The imposing concrete dome of Cirus is a feat of technology. Inside, there was awesome stillness save when an occasional instruction was carried by the microphone and echoed by the walls. There were but a few men working within, not more than two dozen.

Canadian Co-operation

After Apsara, India was thinking of building a larger experimental reactor. Canada offered to co-operate in building a 40 megawatt—40 times more powerful than Apsara—reactor at Trombay. Canadian engineers designed the reactor. In four years, in 1960, the reactor was completed in collaboration with Indian engineers, and became critical. The project cost about Rs 10 crore, shared in roughly equal proportions by Canada and India.

The reactor and the storage block, containing the natural uranium fuel, are housed in a pressure-tight steel shell called *rotunda*. The cylindrical structure is 120 ft. in diameter and 134 ft. high. The outer side of the dome is clad with aluminium. The fuel used here is natural uranium and the moderator, which slows down the fast neutrons emitted by uranium from speeds of about 10,000 miles per second to one mile per second, is heavy water.

The heart of the reactor is an aluminium tank called the

'calandria', about 8 ft. 9 in. in diameter and 11 ft. high. About 200 vertical aluminium tubes, running through the calandria from end to end, contain the fuel rods, shut-off rods (by operating which the reactor can be shut off) and experimental assemblies. Each rod is 1.36 inches in diameter, 10½ feet long and contains about 55 kgs. of uranium. The calandria also contains the heavy water moderator. By varying the level of the heavy water, the power level at which the reactor operates is controlled.

Surrounding the calandria are two concentric blocks of graphite which prevent leakage of neutrons emitted by the uranium fuel and reflect them back into the calandria. Around the graphite reflectors are two cast iron shields which absorb the intense radiations given off from the nuclear reactors, and an 8 ft. thick concrete biological shielding. These two shieldings together give enough protection to the operators and scientists who work around the reactor.

Catalyst OF New Successes

An elaborate control and safety system ensures reliability and operational safety of the reactor. Checking and maintenance is done without shutting down the reactor.

Cirrus is used for a number of studies. Outside the reactor wall are several assemblies of instruments and equipment connected to the reactor. These are for irradiating materials or for studies in nuclear physics, chemistry, biology and medicine. The reactor produces a wide range of radioisotopes worth several million rupees a year.

A number of technological achievements were sparked off and catalysed by the setting up of the Cirus reactor. A uranium metal plant, a fuel fabrication facility, a heavy water production unit and a plutonium plant are some of them.

At the time when the agreement for setting up Cirus was signed, it was agreed that Canada would supply one half of the natural ura-

nium fuel required for the reactor and the other half would be supplied by India. This was rather an ambitious commitment, inspired largely by Dr. Bhabha's impatience for results and his confidence in Indian ability. The confidence was justified by our engineers. Now all the uranium fuel needed by Cirus and even more is made in India. How was this possible?

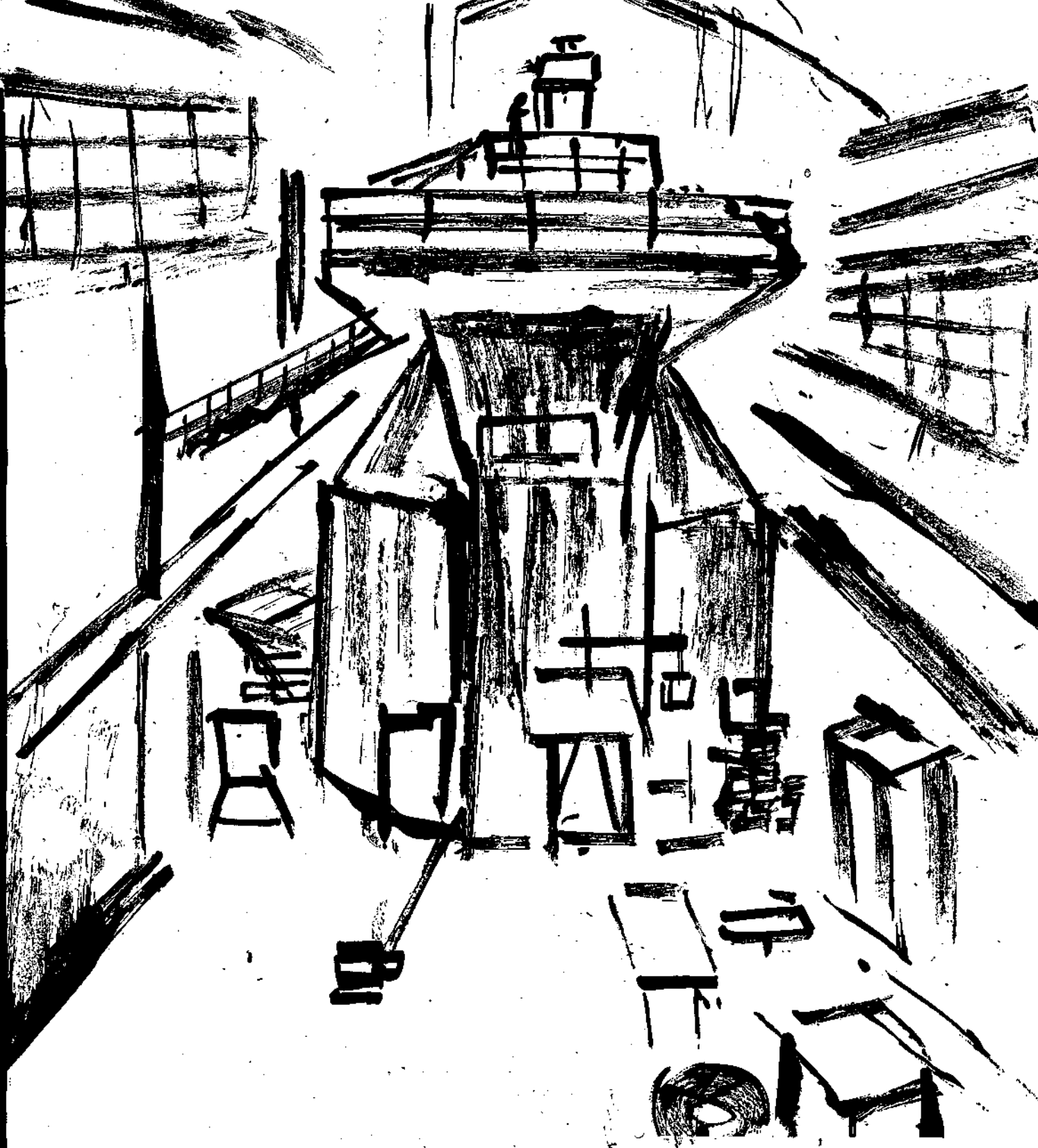
India's major source of uranium, till the large deposits in Bihar were discovered, had been the monazite sand found in the Southern Kerala and Southern Madras beaches. The uranium content of monazite, which is mainly a phosphate of rare earths and thorium, is only 0.3 per cent. When it was decided in 1956 to set up a plant at Trombay to produce nuclear-pure uranium metal, its erection was entrusted to the Indian Rare Earths Ltd. (I. R. E.), a Government company, which had already earned recognition for swift and slick handling and completion of its two earlier projects, the Rare Earth Factory at Alwaye, Kerala, and the Thorium Plant at Trombay. From start to finish, the construction of the uranium plant took only less than a year.

The uranium plant looks like any other chemical manufacturing plant—large metal vats or tanks, huge pipes, a lot of instrumentation and smell of chemicals. The workers, of course, wear dust masks and gloves.

The starting material for the uranium metal is the crude uranium fluoride obtained from the Thorium Plant. This is converted to uranium metal which, in turn, is fabricated into fuel elements, at the Fuel Element Fabrication Facility.

First With Fuel Element

This Facility began making uranium fuel rods for the Cirus reactor at a time when there were very few countries in the world producing their own fuel elements. India was the first Asian country, outside the U.S.S.R., to produce



APSARA IS HISTORY

them. Fabrication of uranium fuel is considered a tricky operation because of its capricious metallurgical behaviour and its fire-catching possibilities. The Trombay Facility is in the nature of a pilot plant and made the first fuel rods for the Cirus reactor. With the experience gained in this, a large Fuel Fabrication Plant is coming up at Hyderabad to make the fuel elements for the nuclear power stations. A fuel rod for the Cirus reactor is 10.25 ft. long and 1.36 inch in diameter. It consists of uranium metal sheathed in an aluminium tube. When fully assembled with top and bottom attachments, the fuel elements will be about 32 ft. long. A very strict control is maintained at all stages to keep the impurities in every component down to a few parts in a million. The physical and metallurgical work at the Facility involves the utmost engineering skill and precision.

To convert uranium metal into a fuel element, it costs about Rs. 1.3 lakh. A single charge of 10 tonnes which would keep Cirus working for less than a year would cost Rs. 26 lakh. Imports would cost almost a third more.

As important as the fuel in a reactor is the moderator which slows down neutrons and facilitates nuclear reactions. For Cirus, the heavy water is at present supplied from Nangal where a heavy water plant produces 15 tonnes a year (cost of heavy water is Rs. 3 lakh or more per tonne). But as a prelude to setting up a 200 tonne plant to meet the needs of the

Rajasthan and Madras atomic power stations, a pilot plant at Trombay has been set up to study and collect data for the design of the large scale plant.

Unlike Apsara and the much larger Cirus, 'Zerlina', the third research reactor at Trombay, has a maximum power level of 100 watts. 'Zerlina', which stands for zero energy reactor for lattice investigations and new assemblies, has, however, been valuable in studying different combinations of nuclear fuels and moderators for developing power stations in future. Like Cirus this also uses natural uranium as fuel, and heavy water as moderator. The reactor and other accessories are enclosed in a 21 ft. square concrete tank.

Imprisoned Bundle of Immense Power

An unforgettable experience was the visit to the Plutonium Plant in the B.A.R.C. campus. This plant separates the plutonium and fission products from the used uranium fuel from the reactors.

Plutonium does not occur in nature. In the Cirus and Zerlina reactors, a portion of uranium fuel is transformed to plutonium during burning. Each kilogram of uranium gives approximately one gram of plutonium after full irradiation.

Plutonium has immense potentialities for use as a nuclear fuel in what are called fast breeder reactors. When, in a reactor, plutonium is used along with thorium, of which India has the largest resources in the world, energy as well as a highly fissionable material, uranium 233, are produced. For widespread production of nuclear power, India has ultimately to base its technology on plutonium and thorium rather than on uranium. A number of steps are to be taken to reach this goal beginning with dual purpose reactors, fueled with natural uranium producing plutonium and power; then using this plutonium

as fuel to convert thorium to uranium 233, and finally, using uranium 233 as fuel in a uranium 233-thorium "breeder" reactor. This will produce more uranium 233 than is consumed. That is why it is called a breeder reactor. Once this stage is arrived at, we can use thorium as a continuing feed for almost unlimited nuclear power generation. The first step in the multistage scheme has been taken with the completion of the plutonium plant.

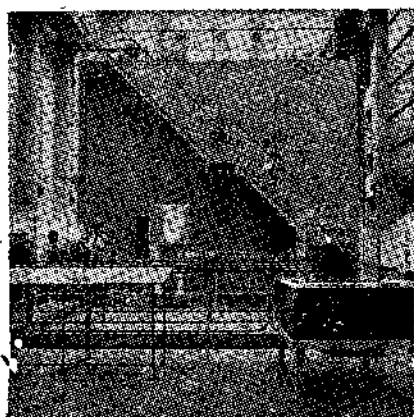
Remote Control

We walked into the plant with an awareness that plutonium has been used in other countries mainly for making nuclear weapons. Safety measures within were severe. We could see little of the actual process. Only two large panelled walls with a huge array of electronic and electrical controls and instruments could be seen. We had to wear white rubber overshoes before we were led into a laboratory where we saw encased in multiple containers a sample of plutonium metal—an imprisoned bundle of immense power. The entire process of separating plutonium from the irradiated fuel associated with a large quantity of highly radioactive fission products is carried out behind thick concrete walls and is controlled by remote instrumentation. Thus the personnel in the plant are protected from radiation.

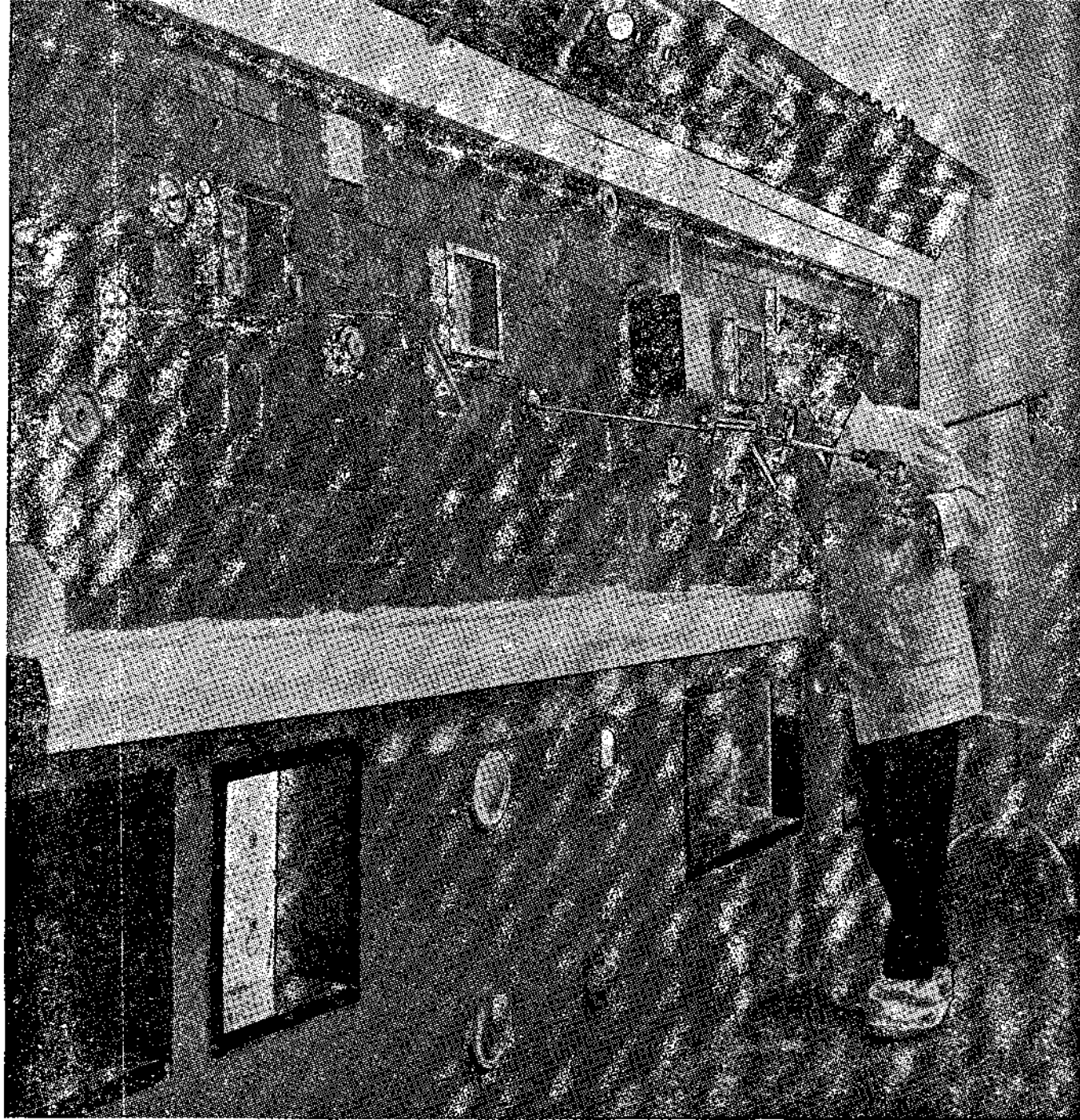
A major hazard with plutonium is that when a particular quantity is accumulated at one place it will become critical and will result in an uncontrolled chain reaction. This is prevented by elaborate safety measures.

Wonder World of Modern Alchemy

The atom, for all its power, is a kindly and beneficent force in its wonderful life-saving form, the isotope. B.A.R.C.'s reactors prepare isotopes of several elements.



Zerlina, the research reactor which has been used in study of fuels and moderators for future power stations



The "Gamma Hall" in the isotope laboratory where radioisotopes are processed behind thick lead shields to keep off radiation

These are chemically processed by its Isotope Division. More than 350 different isotopes, labelled compounds (compounds containing a radioactive constituent), and other radioactive products are made there. They go to hospitals, universities, research institutes and industries.

Cobalt-60

Radioisotopes are used in the diagnosis and treatment of various

diseases. They help diagnose thyroid disorders, locate brain tumours and study the function of various organs like liver and kidney. They are also widely used in the treatment of cancer.

About sixty institutions in the country use radioisotopes for medical purposes. Recently the Isotope Division made its first supply of cobalt-60 to an Ahmedabad hospital. In biology, man's understanding of the process of

life has deepened with the help of isotopes. They have laid bare the mechanisms of the building of proteins, enzymes and vitamins. In industries like steel, chemicals, petroleum, plastics, paper-making and machine-building, isotopes are used as tracers for better control of complicated technological processes, resulting in considerable savings. They work on almost the same principle as X-rays. Isotopes play a key role in the improvement of agriculture. They help in evolving high-yielding strains of crops and in showing the way to better methods of applying fertilisers.

The laboratories of the Isotope Division are a world apart—a world of 'untouchability'. One can enter them only wearing overalls and overshoes, to avoid contamination. Scientists and operators wear protective suits, gum boots and thick rubber gloves. Operations which are done by hand in an ordinary laboratory, like pipetting, pouring and filtering, are being done here by remote control, using mechanical gadgets from behind thick radiation shielding made of plastic or glass.

In this wonder world of modern alchemy, sulphur changes into radioactive phosphorus, tellurium metal is turned into radioactive iodine, a nonmetal. Not only does the B.A.R.C. produce these isotopes but also makes instruments to handle them. In 1967 the sale of radioactive products and accessories resulted in a saving of about Rs 35 lakh in foreign exchange. The sale of isotopes alone netted Rs. 13 lakh. Australia and France and several Asian countries including Japan buy isotopes from the B.A.R.C.

Pioneering Work In Electronics

Not only has the B.A.R.C. nursed and nourished several vigorous atomic development projects but has also brought under its protective wings many other bonny technological babies which show promise of outgrowing the parent.

One such is the Electronics Division. From a small workshop in a war-time hutment at the Tata Institute of Fundamental Research in Bombay it has grown into the Electronic Corporation of India, an autonomous public sector undertaking at Hyderabad.

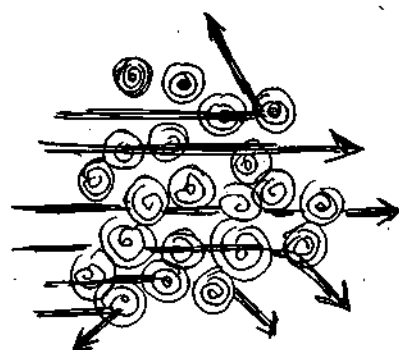
The first major venture of the Electronics Division was the making of the control system and electronic instruments for Apsara. Its success gave a big boost. Soon came out from the Division a series of instruments for nuclear studies in physics, biology, agriculture and medicine.

The production has continued to grow in volume, range and sophistication—400-channel pulse height analysers, analogue computers, and several components like carbon film resistors, potentiometers, transistors, diodes and so on. Ten lakh rupees worth of electronic equipment were made for the Tarapur atomic power plant. The worth has now been proved and the Division has been asked to make for the Rajasthan Atomic Power Project equipment of the value of Rs. 120 lakh.

At present the Division is making an on-line digital computer (cost Rs. 5-6 lakh) which Mr. A.S. Rao, the Director, hopes to put into operation in two months from now. Once it is tried and tested for perfection, dozens of it will be produced at Hyderabad.

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WHAT IS A CHAIN REACTION ?

WHEN the nucleus of certain heavy elements like uranium is bombarded with a neutron, it breaks into two roughly equal fragments, releasing two neutrons and tremendous energy. This is called *nuclear fission*. All elements are not fissionable.

Among the nuclei which break up by bombardment are the uranium isotopes 233, 235 and 238, thorium 232 and plutonium 239. Among these plutonium does not occur in nature. In the case of uranium 235 and 233 and plutonium 239, fission occurs, even if the neutrons have only very low velocity. They are, therefore, called *fissile materials*. Uranium 238 and thorium 232 change into plutonium 239 and uranium 233 respectively before they undergo fission. They are called *fertile materials*. When a single neutron is absorbed in a large mass of fissile material, fission occurs. Two secondary neutrons are produced and a large amount of energy is released. If both these neutrons produce fission, there will be four neutrons in the third step, and then eight, and so on. Thus it becomes a self-perpetuating process and is called a chain reaction.



ANATOMY OF MATTER

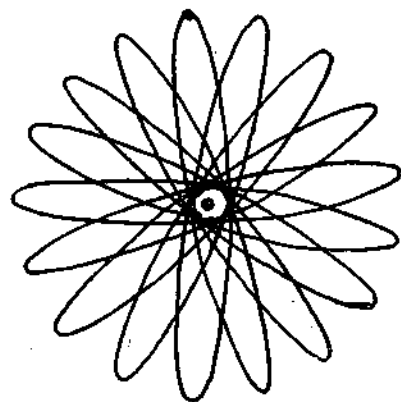
ALL matter in nature is composed of one or other of 92 elements. The smallest particle of any element that has all the qualities of that element is called an atom.

The atom of one element differs from that of every other. Hydrogen has the lightest atom and uranium, the heaviest.

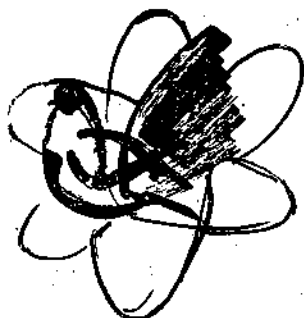
An atom of any element consists of a central core called the *nucleus* round which move in orbits negatively charged particles called *electrons*. The nucleus is positively charged while the atom itself is electrically neutral.

Although the nucleus occupies only one ten thousand billionth part of the volume of an atom, almost the entire mass of an atom is concentrated in the nucleus. If it is possible to separate a very large number of nuclei from the surrounding electrons and collect them together to make the size of one drop, it is estimated that the drop would weigh 2 million tonnes.

The nucleus consists of two kinds of particles, *protons* and *neutrons*. They have the same mass, but while the proton is positively charged, the neutron has no charge.



Atom Means 'Can't Be Split' But Atoms Are Split



MOST atoms in nature are stable; but there are a few whose nuclei break down and emit some particles from the nuclei with high energy. These particles are called *alpha particles*, *beta rays* and *gamma rays*, and this breaking down is known as *radioactivity*. It was concluded by scientists that if atoms gave off energy, then they must contain lots of it.

Scientists found that radioactive elements, like uranium and radium, "decay" into other elements. Some decay very slowly; others fast. The period in which the radioactivity of an element is cut down to half is called its *half life*.

In 1933, Irene and Frederic Joliot Curie bombarded aluminium with alpha particles and found that it had changed into radioactive phosphorus. Thus radioactivity was generated artificially. Later, Rutherford, in England, discovered that atoms could be broken down by bombarding them with alpha particles. Protons and neutrons came out from the nucleus. Fermi found neutrons more effective to bombard the nuclei and break them, because neutrons have no electric charge and would penetrate into the nuclei and produce a nuclear reaction. He thus produced several radioactive isotopes: phosphorus from chlorine, aluminium from silicon, manganese from iron.

BOMB AND REACTOR

WHAT ARE ISOTOPES?

WHEN a chain reaction takes place in a system, the energy released by fission appears as heat in the system. If the heat is generated extremely rapidly, a violent explosion occurs. This is what happens in an atom bomb.

Neutrons produced in fission move at high speed, about 12,800 kms per second. But the chances of neutrons flying at such speed hitting a nucleus are small, unless the material is sufficiently large. The lump of uranium 235, for instance, has to be larger than a critical size to support a chain reaction and to explode violently. There are always some neutrons present in uranium due to spontaneous fission so that there is no need to bombard the supercritical mass with neutrons. But in actual practice, many of the neutrons would escape, the intensity of reaction increase rather slowly, and heat produced would melt and disperse the uranium, before explosion had been developed. For an atom bomb, the parts of the supercritical mass will have to be assembled with almost unbelievable speed.

In a nuclear reactor the chain reaction is kept under control and made to operate at a steady rate. It is not necessary to use pure U 235 as in the bomb, but natural uranium or enriched uranium containing small amounts of U 235. In a nuclear reactor, the reaction is controlled by the insertion of elements which have a high capacity for absorbing neutrons into the fissile material.

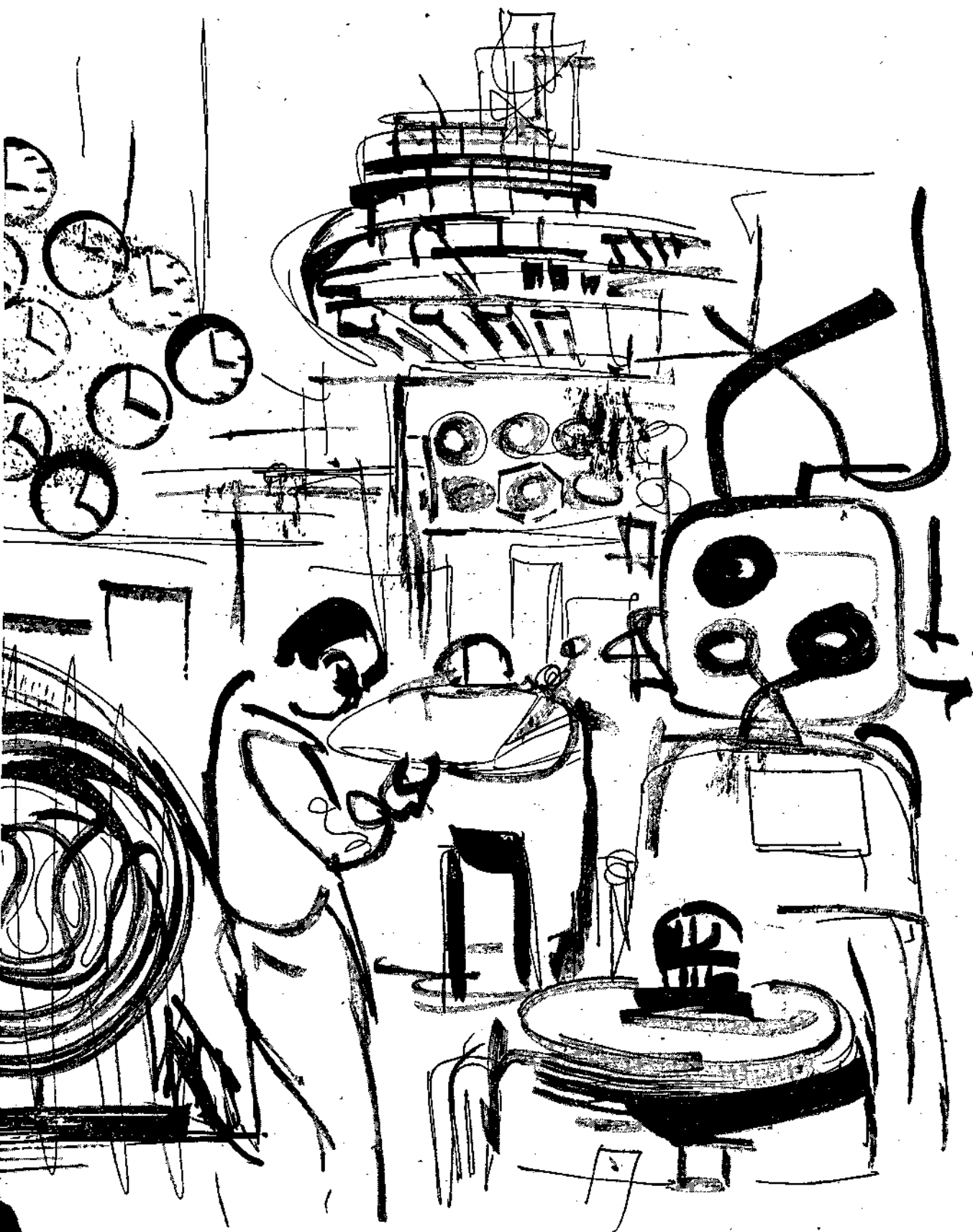
Fast neutrons emitted by fission have to be slowed down so that they have a better chance of hitting the nuclei of U 235. This is done by the use of *moderators* which recoil the neutrons.

Nuclear reactions reach temperatures of the order of a million degrees centigrade. Unless the reactor is cooled, it would vaporise off. So a cooling medium has to be used by which the energy can be withdrawn for use.

NEUTRONS and protons make up the nucleus of an atom. But it is the number of protons that determines the element to which the atom belongs. Atoms which have different numbers of neutrons but the same number of protons will, therefore, have the same chemical properties. Their atomic masses will be different and their physical properties may vary. They are called *isotopes* of the same element. For instance, two isotopes of uranium occur in nature—U 238 and U 235. U 238 has 238 and U 235 has 235 protons in the nucleus.



TROMBAY as seen by our
artist, R. Sarangan. The cover
also has been designed by him.



READY FOR

TOMORROW'S

POWER NEEDS

"We are all quite excited about it."

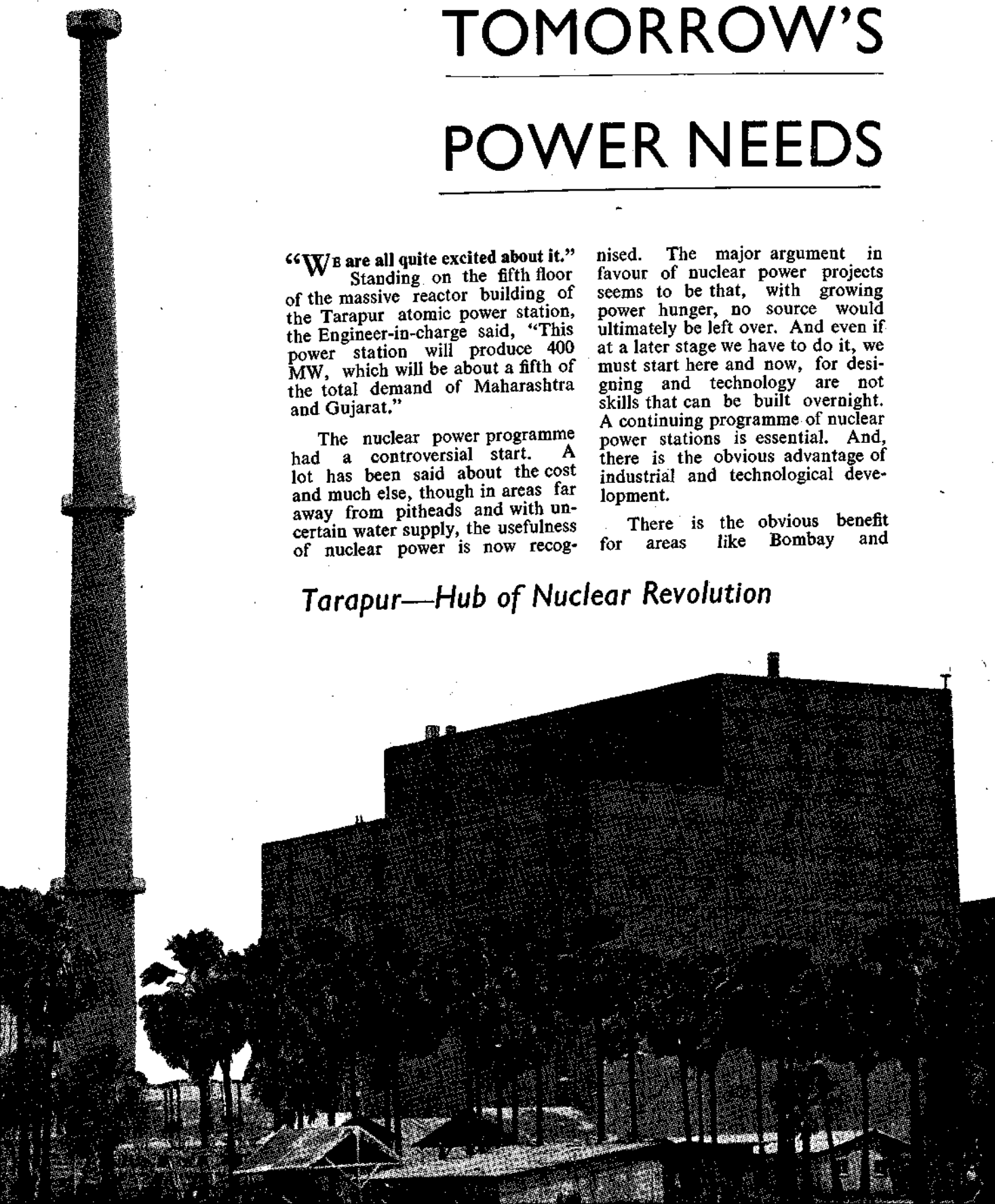
Standing on the fifth floor of the massive reactor building of the Tarapur atomic power station, the Engineer-in-charge said, "This power station will produce 400 MW, which will be about a fifth of the total demand of Maharashtra and Gujarat."

The nuclear power programme had a controversial start. A lot has been said about the cost and much else, though in areas far away from pitheads and with uncertain water supply, the usefulness of nuclear power is now recog-

nised. The major argument in favour of nuclear power projects seems to be that, with growing power hunger, no source would ultimately be left over. And even if at a later stage we have to do it, we must start here and now, for designing and technology are not skills that can be built overnight. A continuing programme of nuclear power stations is essential. And, there is the obvious advantage of industrial and technological development.

There is the obvious benefit for areas like Bombay and

Tarapur—Hub of Nuclear Revolution



PERSPECTIVE OF THREE PLANTS

The significance of India's atomic power programme is that when the traditional sources of power become inadequate for the country's growing industries and use in the villages, our technology will be in a state of preparedness for a nuclear breakthrough.

Madras where transport of coal from the fields to thermal stations would be highly expensive and a burden to the railways. In Madras, owing to wide variations in seasonal rainfall, there is the further factor of unreliable hydro potential. In parts of Rajasthan the load is remote from coal fields resulting in high power costs.

Why Tarapur

The western region was chosen for the first nuclear power station because of its rising power demand, inadequacy of conventional sources of power and the very long load involved for the transport of coal. From several technical and economic considerations, Tarapur, 60 miles north of Bombay, was accepted as the most suitable for locating the station.

The Tarapur station will have a capacity of 400 MW supplied from two reactor units of 200 MW each. After allowing for the consumption of power within the station, 380 MW will be fed in equal measure to the electricity grid systems of Gujarat and Maharashtra.

When we visited Tarapur, work was at its peak, and at such periods some 6,000 people are employed. The heavy steel structures are placed in position by a 300-ton derrick crane, perhaps one of the largest of its kind. The reactor vessel which weighs 270 tonnes has been fitted into a deep cavity. Since our ports could not handle such heavy equipment, a jetty was built at Tarapur and a special low draft vessel was hired to bring in the equipment.

"The whole containment vessel, 66 ft. in diameter and 100 ft. high, in the shape of a flask which surrounds

the reactor was welded here", the engineer told me. "Every inch of it was radiographed and tested. The reject rate of welded parts is as low as in Europe or in the U.S.A."

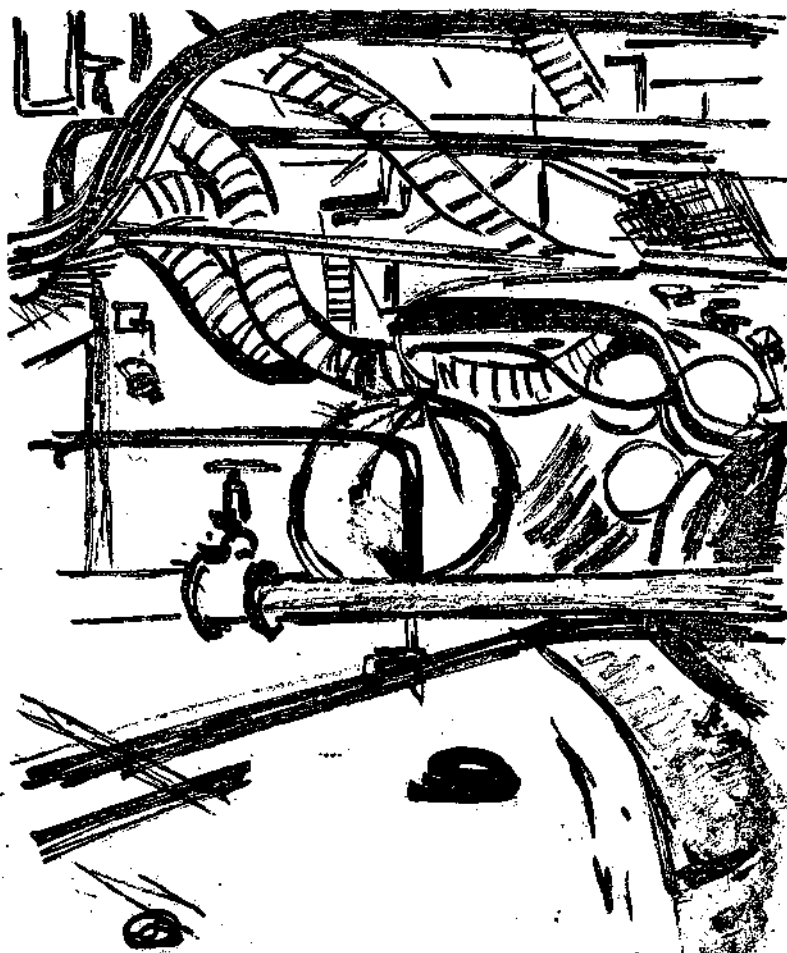
Transformation on the Sea

Tarapur, once a quiet fishing village on the seashore, beyond road and rail, now is the hub of India's nuclear revolution. Its impact is on a wide area around. Electricity for construction comes from Bhiwandi, 55 miles away, and not to Tarapur alone but to the villages along the way and even

away from it. For the local Adivasis, it was a sudden spurt from the secure past to the unknown future.

Since the U.S. is associated with the project, American families are a common sight at Boisar, the nearest railway station, and at the site. And American limousines are equally common.

In a year from now, the Tarapur station is expected to go into full power operation. For a nuclear power station, a reactor is what the conventional furnace is for



The inside of the containment vessel which surrounds the reactor



a thermal station burning coal, oil or natural gas to produce steam which drives a turbine to electricity. Except for the reactor and its associated facilities, all items of power plant equipment would be similar to those as in an ordinary power station.

The Progress

In the Tarapur plant, the reactors will be of the 'boiling water' type using slightly enriched uranium fuel. The heat generated by uranium fission is absorbed by the water that is passed through the reactor. The water boils to produce steam which is then used under pressure to drive a turbo-generator to generate electricity. The exhaust steam is then condensed to water which is again fed into the reactor.

The reactors will require 80 tonnes of uranium fuel to start with and keep running for 2½ years. After that a certain proportion will have to be replaced periodically. Enriched uranium for the first charge has already been

imported from the U.S.A. The fabrication of the recurring requirements of fuel elements will be carried out within the country. A large plant will be set up nearby to extract the plutonium and the residual uranium from the used fuel. It may be possible to reuse the plutonium in the reactors at a later stage and thus reduce future imports of enriched uranium.

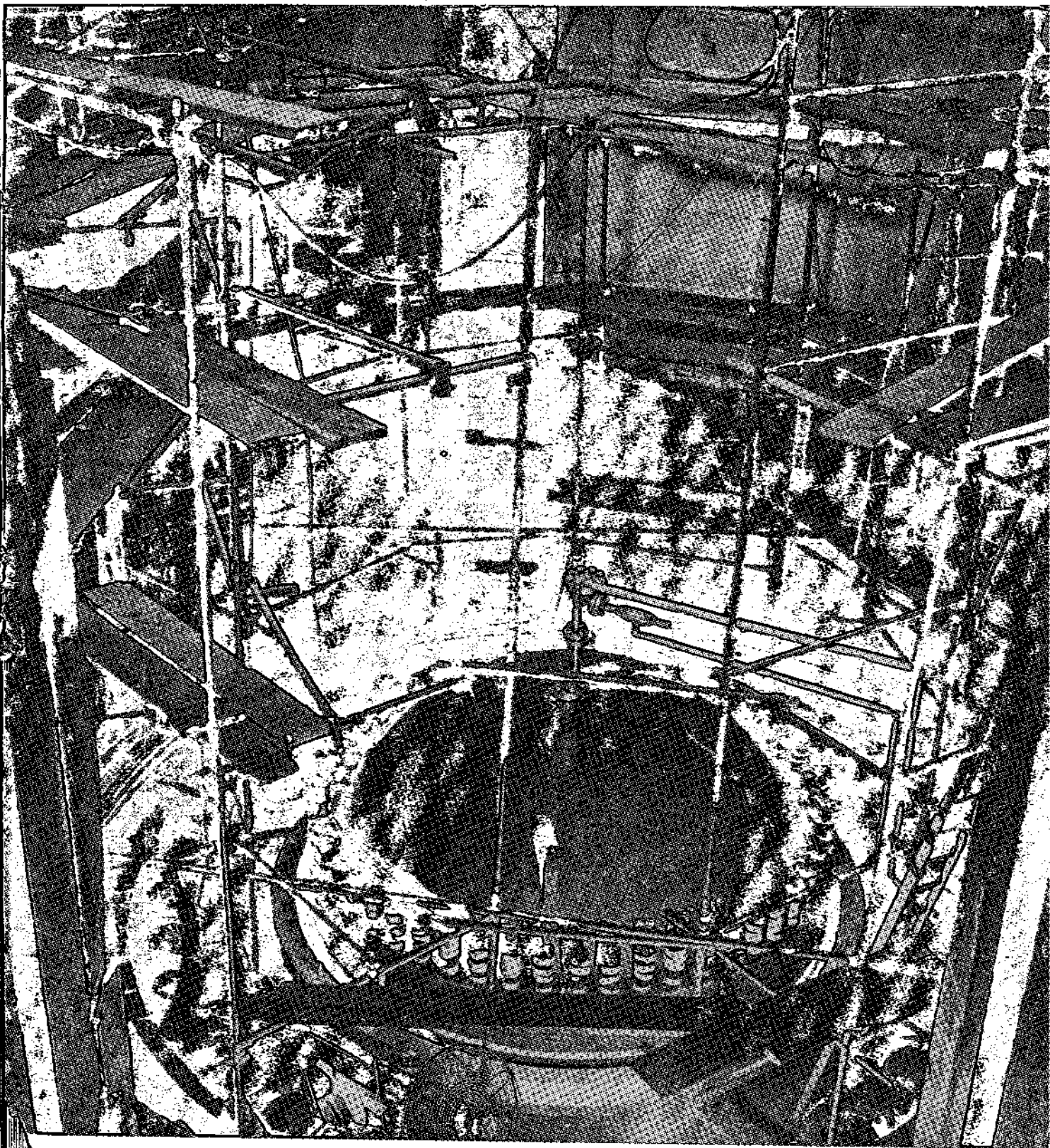
Is Tarapur being built by the American firm on a 'turn-key' basis? This I was eager to find out. Dr Bhabha had said that in the tenders obtained on a world basis the only broad stipulations were about certain technical requirements. He had justified this on the ground that "if we had chosen to build our atomic power stations without external technical assistance, it would have taken us some four years to develop and build a prototype and another four years thereafter to build the full scale station. By resorting to foreign collaboration the first four years of this development have been eliminated."

I was glad to learn about the degree of participation and contribution of our engineers. The engineer in charge explained, "This commercial power station is being built on a prime contract basis, according to mutually agreed design and specifications. Our project team has been fully associated with the project and is continually inspecting the work at site to ensure that this is in accordance with the agreed specifications, codes and engineering practices."

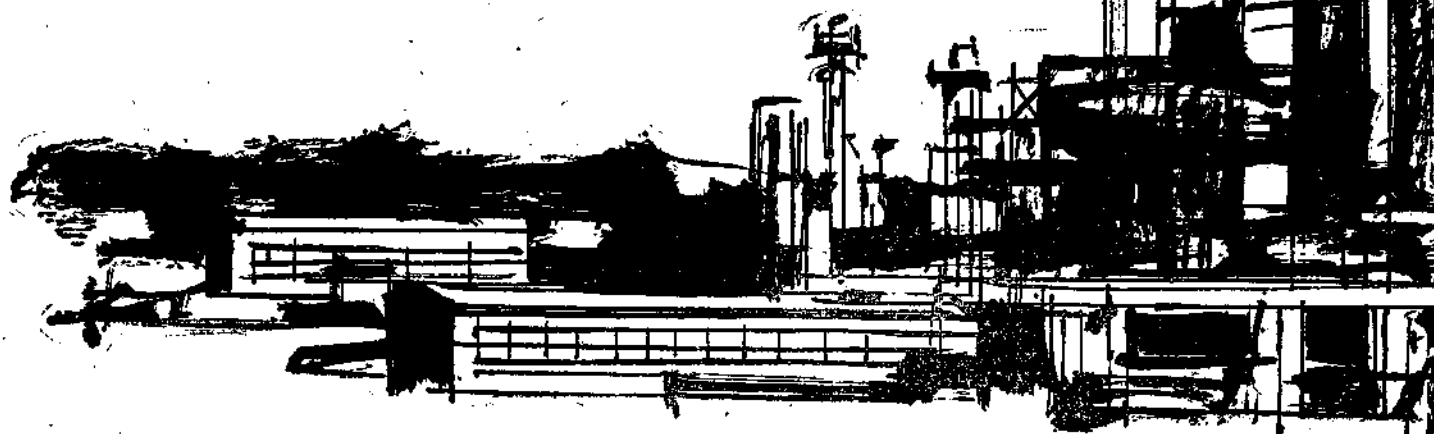
The Second Station

And in the Rajasthan project, Indian skills have a major role. India's second atomic power station rises among the hills, 42 miles southwest of Kotah and 22 miles north-east of the Gandhisagar Dam. The majestic Chambal river flows by, promising all the water requirements of the power station. The massive dome, reminding one of the Canada-India reactor, dominates a vast area, with its framework of timber work, plywood and bars waiting to be capped with

TARAPUR ATOMIC POWER STATION. LEFT: A section of the scram accumulators which are used for inserting the control rods fast to shut down the reactor quickly in an emergency. **BELOW:** The reactor vessel as seen during installation.



India's First at Trombay



POWER CABLES' Industries In Collaboration with Sun Oil Company, U.S.A.

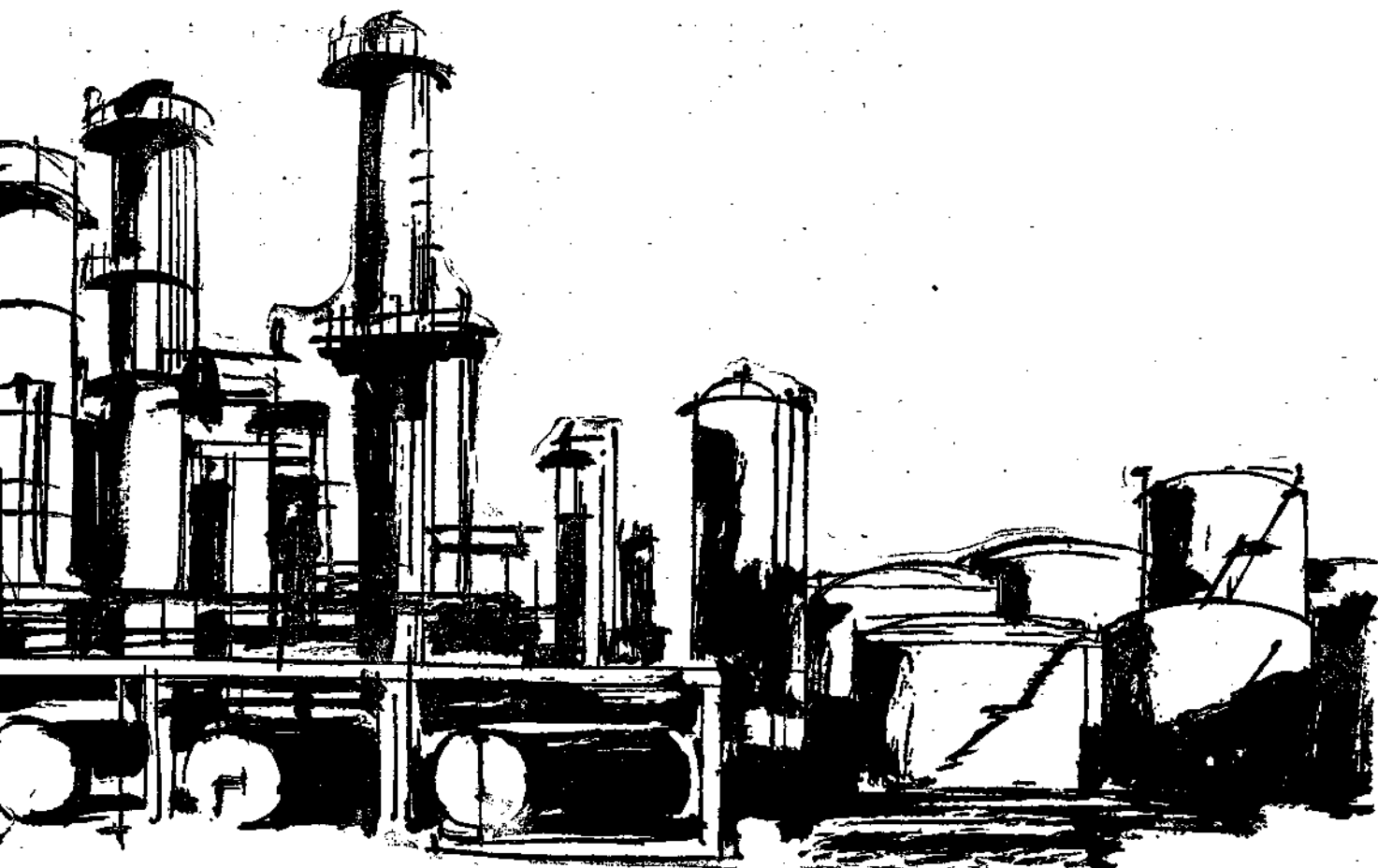
Power Cables will soon make world's finest industrial and electrical oils at their new plant at Trombay, to go on stream in early 1968. Built in collaboration with Sun Oil Company—a world leader in industrial oils, the plant will meet India's industrial oil needs and thereby save foreign exchange worth about Rs. 4 crores. At present, India has to depend totally on imports for electrical and other industrial oils.

These highly specialised oils are vital to India's electrification programmes designed to boost agricultural and industrial output. Their manufacture will bring to India the most advanced know-how and sophisticated equipment

to better utilise our growing oil resources.

Power Cables believe that this is only incidental to their effort to strengthen India's industrial base, to train our technicians, to produce standard products available with full after-sale service and support.

Other Divisions of Power Cables are also working in collaboration with General Electric, Electrodes under licence from Denro of Japan, ACSR and Properzi aluminium rods.

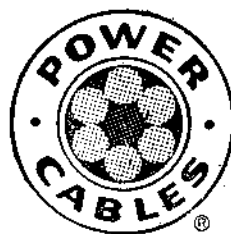


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KALPAKKAM—EXERCISE IN SELF-RELIANCE

concrete. Work goes on round the clock.

The Rajasthan station is based on a Canadian design and will have two Candu type reactors of 200 MW power capacity using natural uranium in the form of oxide as fuel and heavy water as moderator and coolant. As in Cirus, half of the first fuel charge of 56 tons of uranium in the form of oxide will come from Canada and the other half will be from Bombay. The entire construction of the project is being done by engineers of the Department of Atomic Energy. Canadian engineers act as consultants. The cost of the project is estimated at Rs. 60 crore for which the Export Credit Investment Corporation of Canada is giving a loan of 37 million dollars.

"This is one of the biggest international collaboration projects in the atomic field," Mr V. Surya Rao, Chief Project Engineer of the Rajasthan Atomic Power Project, told us. Mr Rao had worked with Cirus at Trombay.

With him are a group of young engineers whose long hours of work did not seem to have made them weary a bit. Mr Rao's simple explanation was that the field was new and exciting and there was a sense of fulfilment.

Wearing white metallic hats we stood one night within the huge concrete building amidst a maze of steel structurals and supports. The hemispherical cum cylindrical reactor building has a diameter of 130 ft. and is 158 ft. high from the basement. Its walls are 4 ft. thick. We were at the mouth of the calan-

dria vault (main biological shield) having 3 ft. thick walls made of very closely reinforced heavy concrete with several embedded parts, cooling coils and so on located to very precise tolerances. Mr Kulkarni, a construction engineer, said: "This is the most difficult civil engineering work I have done so far. Great care had to be taken in quality control. The concrete in this construction weighs on an average 240 lbs per cubic foot while normal concrete weighs only 150 lbs."

This vault will house the calandria vessel, 18 ft high, 20 ft. in diameter and weighing 70 tonnes. In the vessel there will be 306

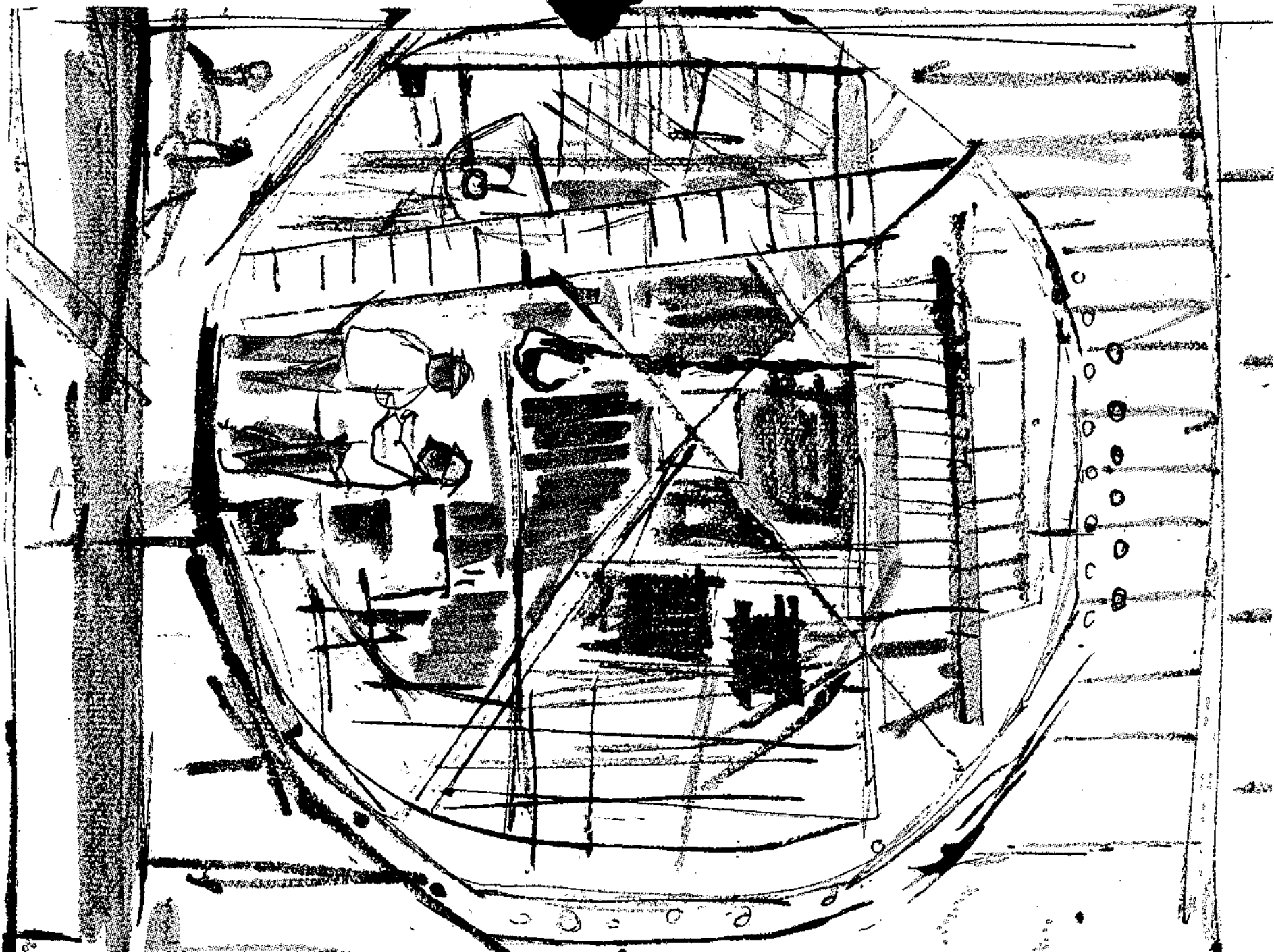
calandria tubes into which natural uranium in the form of oxide will be fed in. Part of the large amount of heat generated by the reactor will convert water into steam through heat exchangers. The steam will drive the turbine to produce electricity.

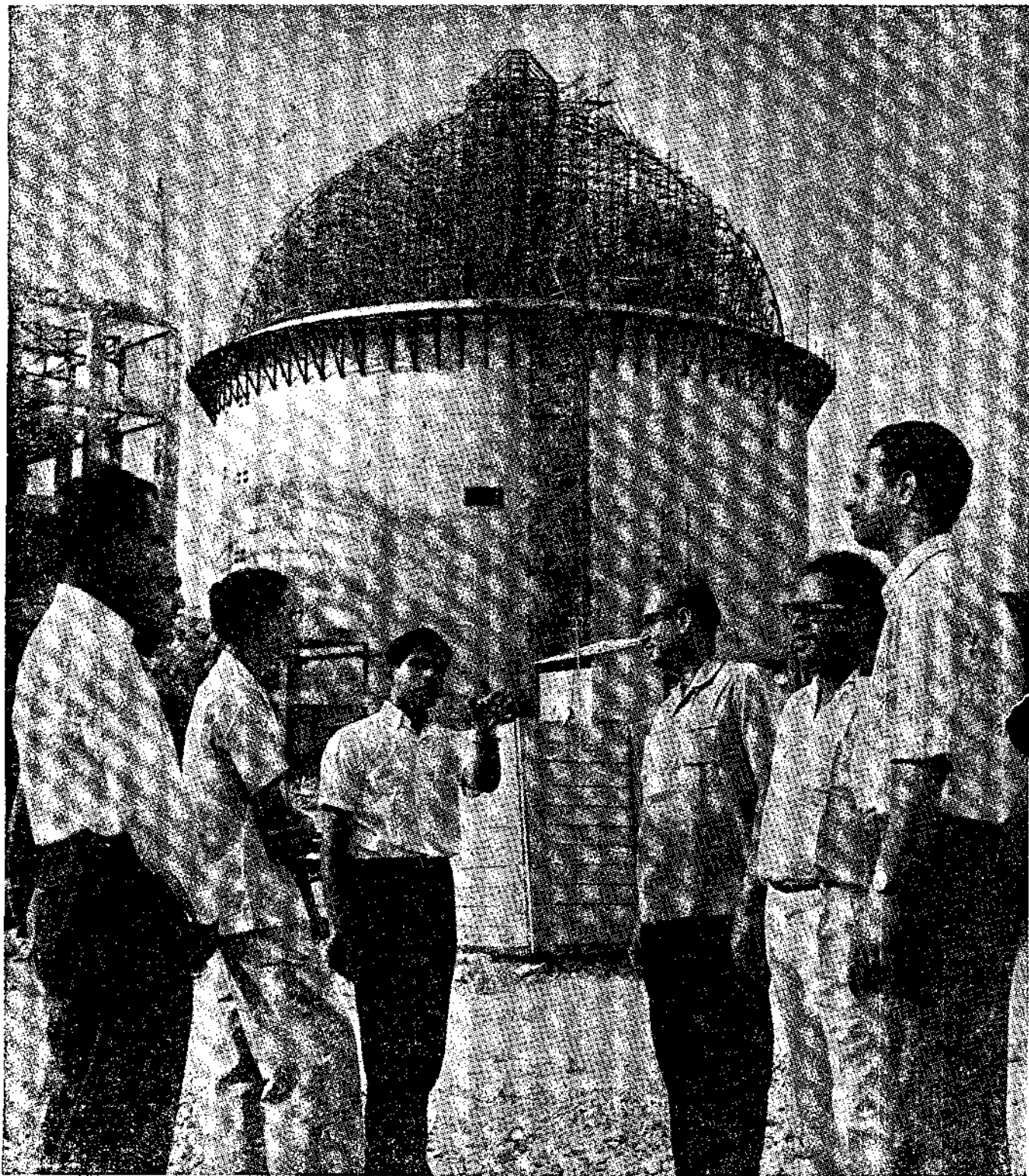
"We never take any chances in this construction work. Even a minor fault will cause unforeseen troubles and the consequences will be tremendous, you know." This was Mr Kulkarni's way of helping us into the detail.

The Rajasthan power station has given birth to a few new industries. One such is the development of



The site at which the Madras atomic power station will rise in the next few years. Engineers at the site. Right: Artist's impression of the calandria vault of the reactor under construction near Rana Pratap Sagar in Rajasthan.





Rajasthan - A Big Stride

"We will build our projects"

A view of the reactor building of the Rajasthan atomic power station under construction. V. Surya Rao, Chief Project Engineer (third from right), with his colleagues at the site.



"We must have a higher degree of Indian enterprise", says G.K. Menon, an engineer of Rajasthan power project.

a number of new paints. The concrete perimeter walls of the reactor were to be coated with a particular kind of vinyl and epoxy paint. Till then we were not making them in the country. With technical guidance from the Atomic Power Project engineers, two private firms were able to produce them. Canadian engineers tested these paints and found them very efficient.

But Mr G.K. Menon, Mechanical Erection Superintendent of the power station, a young, short, wiry mechanical engineer trained in Canada, would like to see even a higher degree of Indian enterprise.

Kalpakkam

The Madras power project on the Kalpakkam beach, about 40 miles from Madras city and four miles from the shore temple of Mahabalipuram, is gathering momentum. The entire design, construction and operation of this power station will be the responsibility of our engineers. Sites have been marked out, spots have been fixed for the power station, a housing colony, a school and a hospital. Elegantly designed living tenements are coming up. A 17th cen-

tury Dutch fort is nearby. The background of palms, casuarinas and coconut trees adds to the setting.

Work is yet to begin on the reactor. But the pace is quickening.

Many studies are being completed: soil analysis, micrometeorological studies of wind velocity and direction and so on.

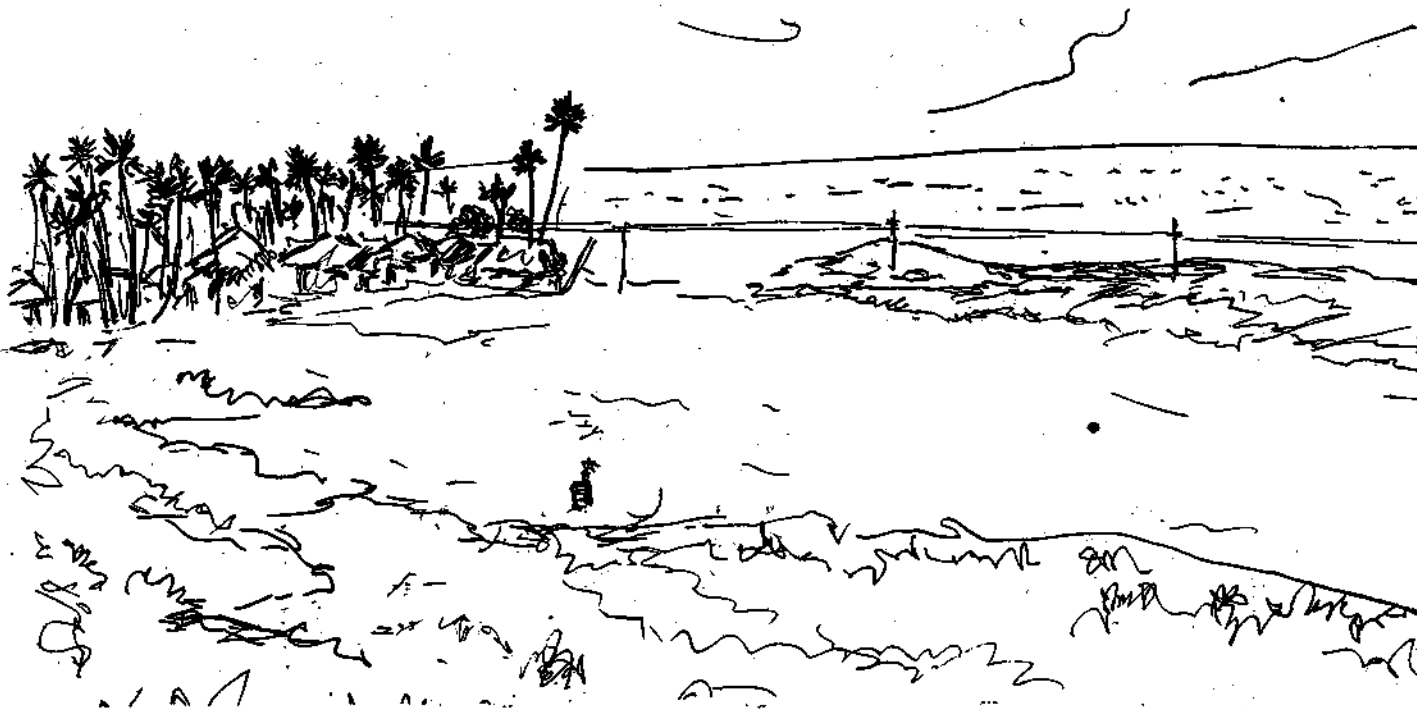
A fast reactor is also proposed to be built close to the site of the Madras station.

First of its kind

"This fast reactor will be the first of its kind in the country," said Dr M.R. Srinivasan, the Chief Construction Engineer, who had just taken over when we went there. "The U. K. is building a big one. There are two in the U.S.A. Ours will be for prototype studies for similar bigger ones."

Madras promises to be a vigorous exercise in self-reliance in reactor technology. Its fast reactor will be the forerunner of all our future nuclear power generation plants that will use the vast resources of thorium with the plutonium produced in our first natural uranium reactors.

The reactor site at the Kalpakkam beach



Fuel of the Future

SAND IS GOLD

INDIA'S THORIUM RESERVES

LARGEST IN WORLD

THORIUM is the atomic fuel of the future and in thorium, India is the envy of the world. This country has the largest known reserves of thorium—about 500,000 tonnes in terms of thorium oxide. About 300,000 tonnes of this was discovered by the Atomic Energy Commission in the late 'fifties. Thorium, on neutron irradiation, changes into fissile uranium-233 and through the process each tonne of thorium fully burnt can yield as much energy as 3 million tonnes of good quality coal.

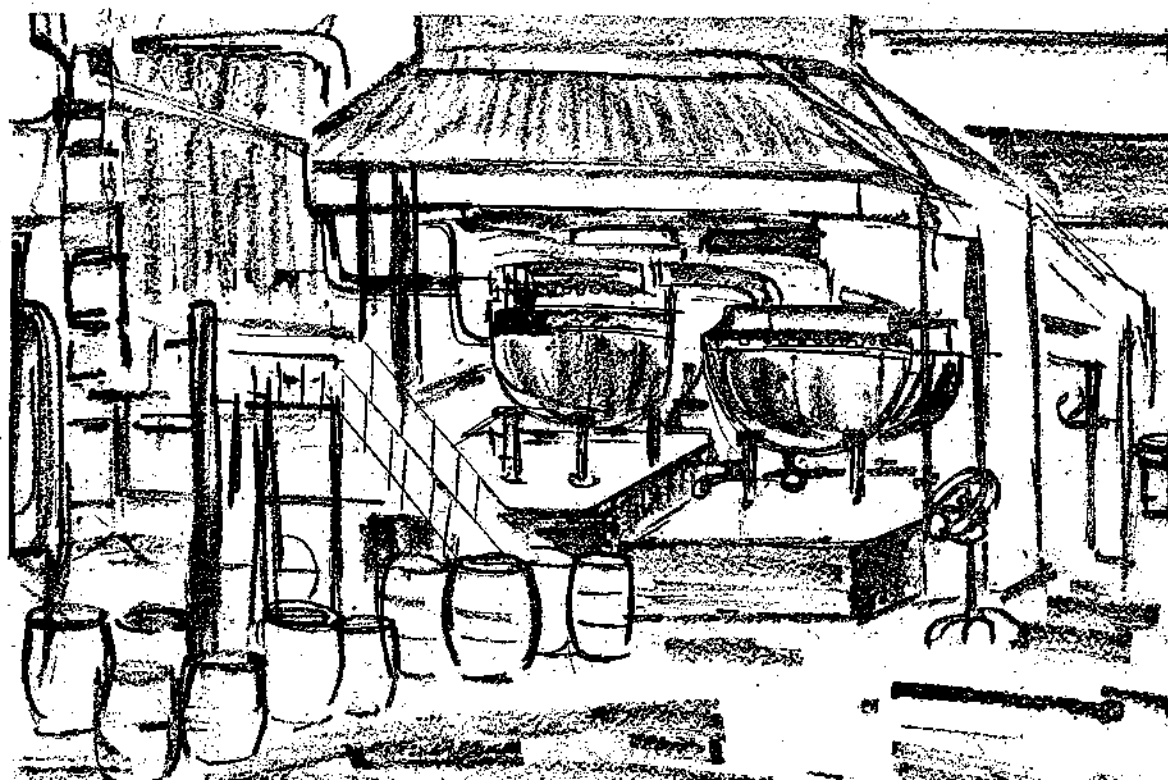
Till the end of the second world war thorium had only one major use—in the gas mantle industry. In India it was found in the form of monazite—a phosphate of thorium and rare earths—on the Kerala and Madras beaches. Travancore's monazite was a discovery of chance, by a chemist in Germany in 1909, who analysed the yellowish green sand. The result was unrestricted export of hundreds of tonnes every year.

The strategic importance of thorium was the reason for the Government of India's decision in 1947 to ban uncontrolled export

of monazite. And one of the first acts of the Atomic Energy Commission after it was formed in 1948 was to set up a plant at Alwaye in Kerala for processing monazite. The Indian Rare Earths Ltd. (I.R.E.) with the Central and State Governments as share-holders was constituted soon thereafter.

Today I.R.E. is a flourishing concern with three major activities carried out on commercial lines. They are separation of the beach-sands, from the Kerala and Madras coasts, into its various constituents, chemical treatment of monazite to separate phosphate, rare earths and

*The Rare Earth Chloride
Evaporation Plant of the
Alwaye factory*





MANAVALAKURICHI : Carrying sand from the beach to the Separation Plant

thorium and production of thorium nitrate and oxide from the crude thorium cake obtained from the rare earths plants. In the course of nearly two decades Indian Rare Earths products have earned a name for their quality in international markets. By supplying nearly one-third of the world's requirements of rare earths and by exporting large quantities of minerals it earns valuable foreign exchange. In 1966-67 alone it earned foreign exchange of Rs. 1.07 crore.

The sand on the beaches of Chavara, near Quilon, in Kerala and of Manavalakurichi, not far from Kanya Kumari in Madras State, is as good as gold. More than 60 per cent of the sand is black ilmenite, estimated at over 50 million

tonnes, from which titanium dioxide, one of the whitest of pigments, is obtained. The most important constituent is monazite (yellowish green). The monazite deposit in Kerala is estimated at about 1.5 million tonnes. The other constituents are zircon (white), rutile (black), sillimanite (white), and garnet (red).

The mineral sands industry at Chavara and Manavalakurichi had its heyday in the forties when four companies, most of them British-owned, did a lucrative trade.

The Central Government nationalised the mineral sands industry, and in 1965, I.R.E. was entrusted with the responsibility of restarting the mineral sands industry.

The mineral factories at Chavara, when we saw them two months ago, were idle. Outside the plant about 75,000 tonnes of ilmenite had been lying for the last seven years waiting to be cleared. The I.R.E. has taken on the job of scrubbing, cleaning and repairing, as a preliminary to restart the industry with a composite plant to separate all the mineral values contained in the sand.

Mr. S. Ganapathy, Chief Administrative Officer of the Minerals Division, said: "We will completely mechanise the plant. Some more machines will be imported. And in two years, you will find the place throbbing again."

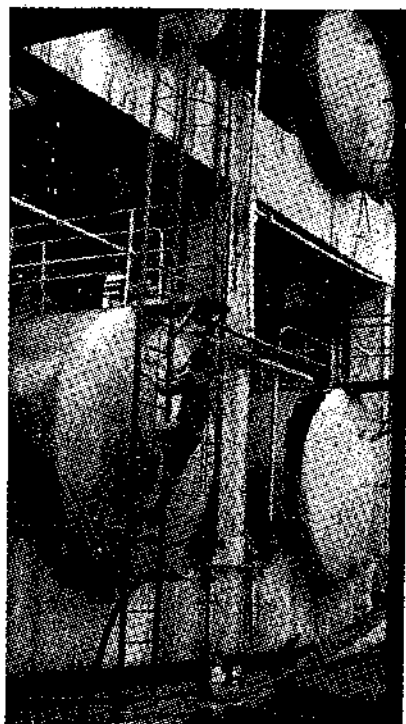
At Manavalakurichi, however, work was in full swing. Here the

EXPANDING SCOPE OF ALWAYS FACTORY

minute particles of mixed beach sands are separated, ilmenite by the magnetic method, monazite by vibration over dry wind-tables and rutile by electrostatic separation.

Monazite travels from Manavalakurichi over 140 miles to the Rare Earths Plant at Alwaye, a cute little factory on the banks of Kerala's longest river, Periyar, making money in sackfuls. It exports all the 3,600 tonnes of rare earths chloride that it makes and earns foreign exchange to the tune of Rs. 85 lakh a year. A bulk by-product, trisodium phosphate (3,800 to 4,000 tonnes), is fully consumed by the country's textile and chemical industries and brings in a revenue of Rs. 26 lakh. The third product is thorium hydroxide (540 tonnes) transported all the way to Trombay for further treatment.

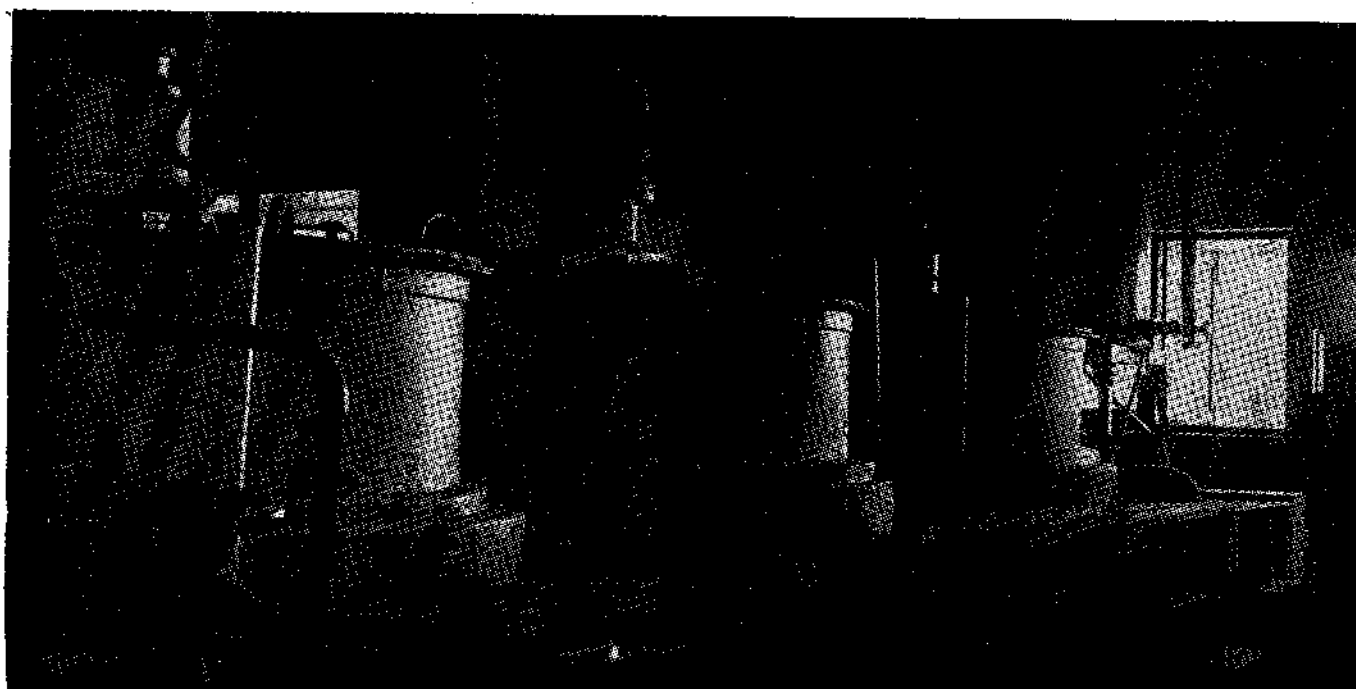
The Rare Earths Plant is a child of Indo-French collaboration. Fifteen years ago when it went into production it had been designed



to treat 1,500 tonnes of monazite a year. The capacity was since then doubled and the expansion had no foreign assistance. It was all the work of the factory's own personnel. A further expansion is on the anvil, involving an outlay of Rs. 7 lakh. Fast nearing completion, the plant will process an additional quantity of 600 tonnes of monazite making the production soar in value by Rs. 22 lakh and the profits by Rs. 7 lakh. Yet another plant to treat 1,500 tonnes is in blue-print and will be built by the company's technicians.

The monazite is finely ground in a ball mill. It is then digested with concentrated caustic soda solution to convert the phosphates of rare earths into hydroxides. From this trisodium phosphate is crystallised out, dried and packed in bags for sale. The solid cake, containing hydroxides of rare earths and thorium, is filtered, washed and fed to extraction tanks. Leaching with hydrochloric acid

ABOVE : The Rare Earths Plant BELOW : The Sulphite
Precipitation Unit of the Thorium Plant at Tarapur



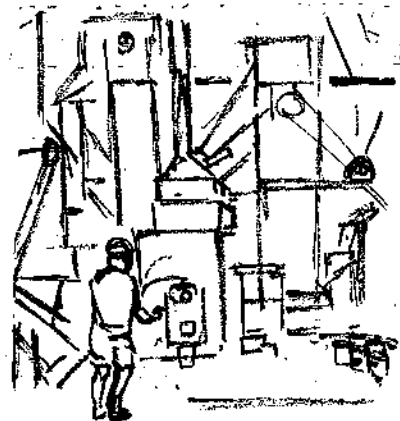


The Fluoride Plant at Alwaye

leaves all the thorium and uranium in a solid state. Rare earth hydroxides converted to chlorides is evaporated and cast in iron drums for export. The solid cake of thorium and uranium is filtered, washed, dried and packed in drums and sent to the Thorium Plant at Trombay.

Mr. G. Rajagopal Menon, the Managing Director of I.R.E., said labour relations have been cordial and proudly referred to the fact that in the last ten years there was not a single strike or lock-out.

At Trombay, the Thorium Plant in the B.A.R.C. campus has been in operation from 1955. Except certain kinds of equipment the entire plant was fabricated in the workshop. The thorium hydroxide cake brought from Alwaye is first dissolved here in hydrochloric acid, filtered and then recovered as sulphate by adding sulphuric acid. It is then purified and converted to hydroxide and washed. The product is dissolved in nitric acid, concentrated and solidified. The



solid thorium nitrate is packed for sale. Some quantities of thorium oxide (nuclear grade) is also produced at this plant.

Although Alwaye produces more than 500 tonnes of thorium hydroxide annually, the Trombay plant at its full capacity can process only less than half of it. But the demand for thorium nitrate has gone down of late, and so the plant handles only 80 tonnes a year. Once the technology of power production based on thorium is fully developed, the thorium market will brighten up.

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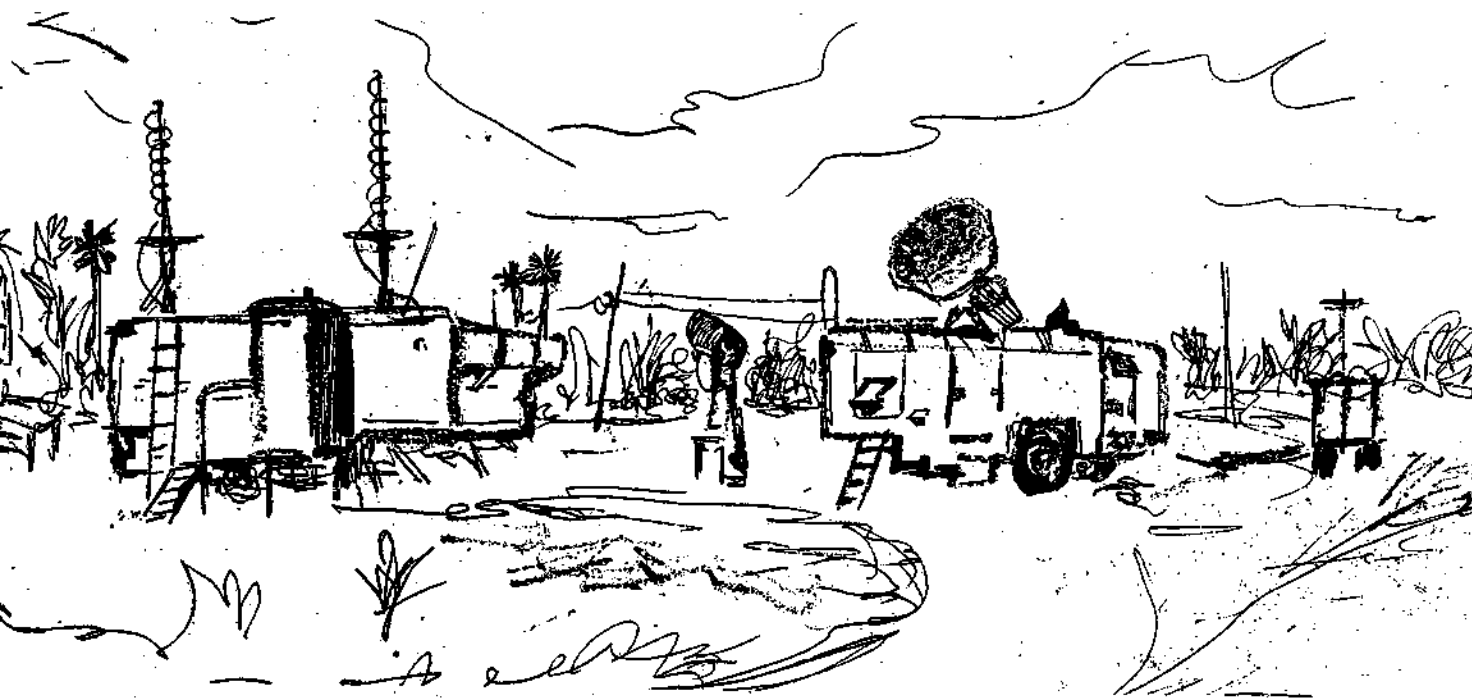
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| (4) Mixed Rare Earths Carbonate | |
| (5) Crude Cerium Hydroxide | |
| (6) Rare Earths Fluoride | |
| (7) Trisodium Phosphate | |



MYSTERY IS YONDER

ON November 21, 1963, India sent its first rocket into space.

The story of India's work in space science, unlike in nuclear research, is only beginning to unfold. Events are, therefore, not many to recount; achievements are yet to be made. In the nature of things, spectacular Mars or moon probes and launchings of manned or unmanned satellites cannot be in India's programme of the near future. The technology involved is immense as the cost is astronomical.

Space has, for long, caught man's imagination and has compelled his striving. The telescope has brought to his ken planets and stars invisible to the naked eye. But a myriad phenomena in the interplanetary space and in the upper atmosphere generally cannot be viewed with the telescope. These could be listed as: upper atmospheric winds, turbulence, temperature, density and compo-

sition, magnetic and electric fields, radio waves and solar radiation.

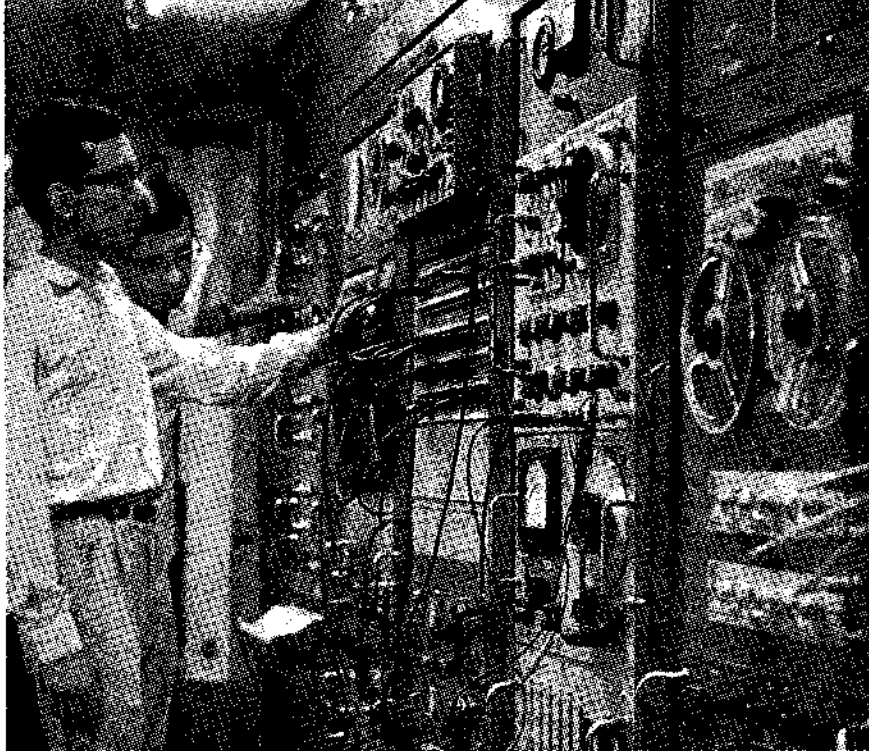
Scientists have used ground-based instruments like radar and radiotelescopes to study some of these phenomena. A large portion of light and invisible radiation from the sun and the stars does not reach us because it gets absorbed and dissipated in the upper layers of the atmosphere or bounces upwards. Thirty five per cent of light from the sun is bounced back by the atmosphere. At a height of 30 kms, the direct cosmic ray intensity is about 100 times what it is on the ground. So ground-based instruments would not alone be sufficient to make a full study of all the solar and stellar radiations. In the last two hundred years, balloons have been used as vehicles to carry instruments and cameras up to 30-40 kms high for studying the upper layers of the atmosphere. The instruments radio back information and the cameras photo-

graph the sun and cosmic ray tracks at those heights. The balloons bring the pictures and recordings back to earth.

SOUNDING ROCKETS

As balloons do not reach beyond 40 kms, scientists had to devise some other suitable vehicle for probing the higher reaches of the atmosphere. In the last decade or so, rockets have come to the aid of the space scientist in a big way. In fact the 40-200 km region can be studied well through direct measurements only with what are called sounding rockets. The region above 200 kms has been brought within the ken of scientists by artificial earth satellites. Except satellites, all other facilities are operated by India.

Naturally the rocket launchings at Thumba and the innovation of an experimental satellite communication station at Ahmedabad have received widespread notice.



Satellite signal tracking and telemetric station of the Physical Research Laboratory, Ahmedabad

Behind these lies a lot of quiet, pioneering, basic work in the laboratories. Two of our major centres of atmospheric and space investigations are the Tata Institute of Fundamental Research and the Physical Research Laboratory at Ahmedabad. The Physical Research Laboratory (P.R.L.) is smaller, but has borne the brunt of space research work. In fact, it is the propellant of India's space science.

In the vast Gujarat University campus, one can easily locate P.R.L. with its wind tower, radio masts and satellite tracking station. It began two decades ago as a small laboratory for the study of cosmic rays. Today it has four major departments dealing with atmospheric physics, cosmic ray and astrophysics, theoretical physics and radiophysics and electronics. P.R.L.'s overall programme is "the integrated study of the different kinds of radiation that are received on the earth and their geophysical consequences". The Headquarters of the Indian National Committee for Space Research (INCOSPAR) is also located in the Laboratory, obviously because Dr. Vikram Sarabhai, its Chairman, an eminent space

scientist himself, is also the Director of the Laboratory.

As in the Tata Institute, here too, the bulk of the scientists are young. They record radio waves from the sun and stars and signals from satellites going round the earth. Their equipment estimate the electron content of the ionosphere. Cosmic rays form one of their major fields of study.

SPECTRA OF STARS

Cosmic rays are the most powerful form of energy hurled at the earth from space. They bombard the earth day and night. They travel at almost the speed of light and strike every spot on earth and go deep into it. Where do the cosmic rays come from? From the sun? From the stars? Scientists have yet to unravel the mystery. Cosmic rays contain protons and heavy nuclei. Continuous recording of cosmic rays is done by P.R.L. at four stations in India: Ahmedabad, Kodaikanal, Trivandrum and Gulmarg. These studies have made the P.R.L. one of the most important schools of cosmic ray research in India. We saw a variety of instruments being made: electronic clocks, fre-

quency counters, detectors and telescopes.

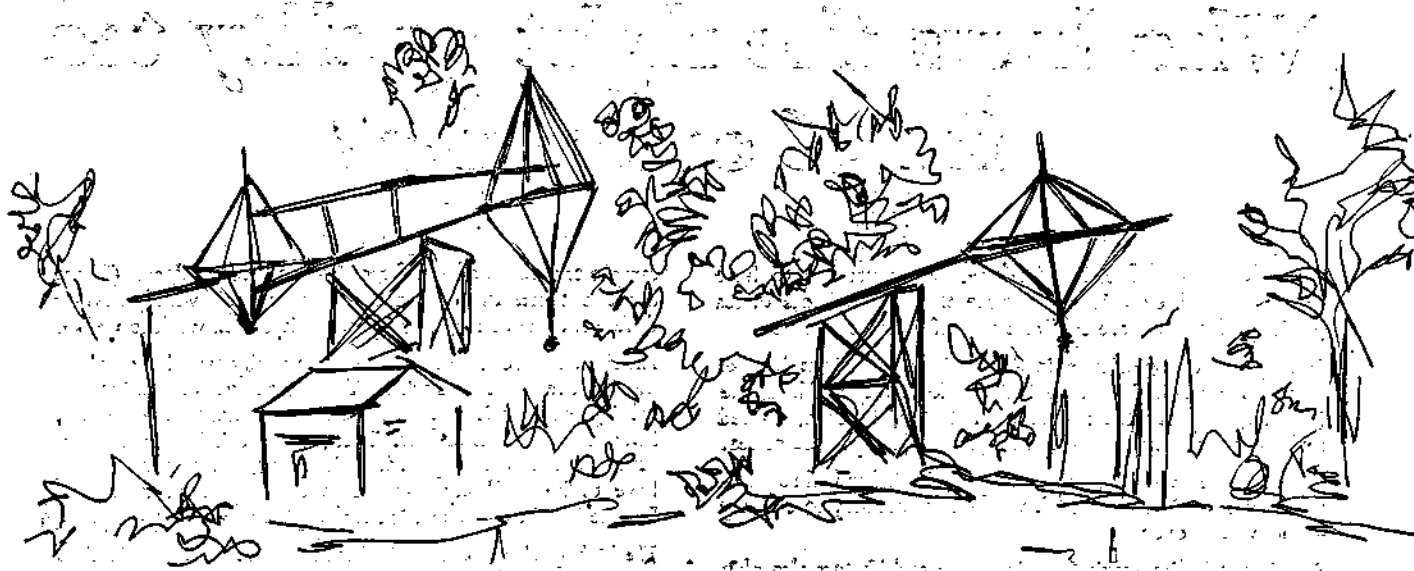
Another intensive field of study for the last 10 to 12 years has been the amount and distribution of ozone in the atmosphere. The ozone is produced by ultraviolet radiation from the sun and is distributed in lower layers by the circulation of the atmosphere. The ozone prevents most of the ultraviolet rays from reaching the surface of the earth. Too much exposure to ultra-violet radiation is harmful to man's skin. It also helps to warm up the upper atmosphere. This study has thrown light on the general circulation of the atmosphere at levels which are not easily observable otherwise.

STUDY OF IONOSPHERE

The uppermost part of the atmosphere above 90 kms from sea level, called the ionosphere, has been the subject of fascinating study for the last five to six decades. The ionosphere is responsible for the transmission of "short" radiowaves round the earth. But changes in the ionosphere disturb efficient radio transmission. Therefore, it is a source of help as well as headache to the wireless engineer.

Ionosphere is able to bounce back radio waves due to its electrification or ionisation. This is dependent on the sun and the amount of radiations that the ionosphere receives from it. Some properties of the ionosphere vary with the sun's activity minute by minute and present a great communications problem. P. R. L. scientists have been seeking answers to questions such as: what is the full spectrum of the energy that comes into the ionosphere? What is the amount of electron concentrations in its various layers? Why do the layers sometimes bounce back radiowaves and sometimes absorb them? How do the layers change with changes on the sun? What are the daily and seasonal changes in ionospheric winds?

P. R. L. scientists use different tools and methods to tackle these questions. They send pulses of high frequencies to the ionosphere, get them back and record. They



The antenna system for the solar radio spectroscope at Ahmedabad

analyse the transmission properties of radio noise from the sun and other stars. The most modern methods for studying the ionosphere include the use of satellites and rockets. P.R.L. scientists make use of these facilities too.

TRACKING STATION

The beacon signals transmitted from the satellites pass through the ionosphere which produces changes in these signals. Such signals when received and recorded on the ground give information on the state of the ionosphere. P.R.L. has a satellite telemetry reception

station which records the scientific data transmitted by various satellites.

More than any other facility, sounding rockets provide the most convenient and useful tool for the experimental study of a large region of the atmosphere between 40 and 200 kms, above the levels attained by balloons and below the operational height of satellites. The Indian National Committee

for Space Research has set up at Thumba an Equatorial Rocket Launching Station (TERLS). Thumba is about 16 kms by road from Trivandrum city. The first rocket was fired in 1963 and in less than two years, rockets launched from Thumba carried payloads comprising instruments entirely made at the Ahmedabad Physical Research Laboratory.

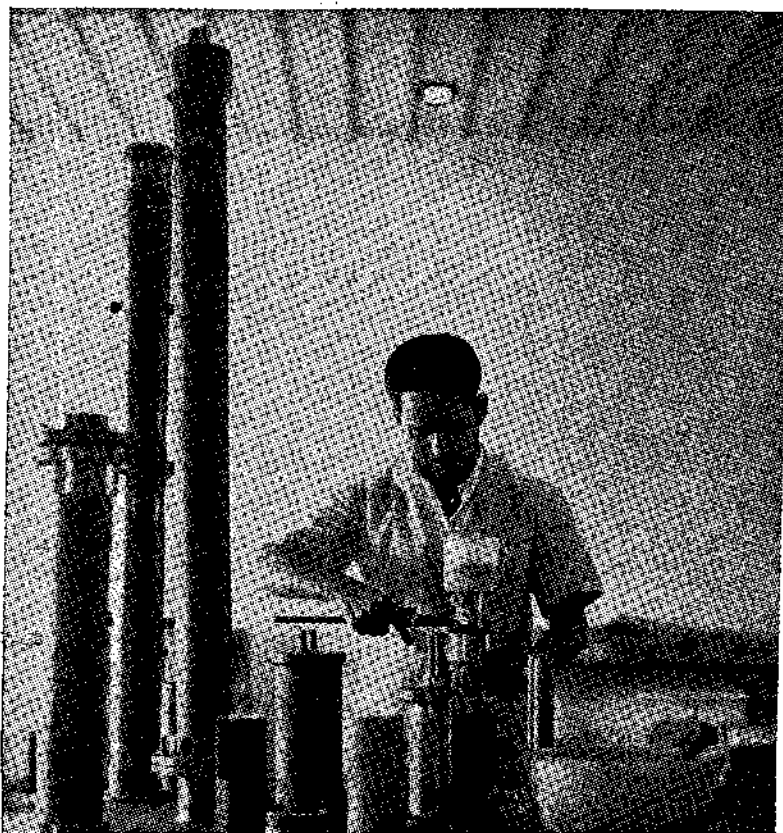
AMIDST COCONUT TREES

TERLS, like the Tata Institute, Trombay and Tarapur, has a lovely location on the seashore. Once a flourishing village of Christian fishermen, the vast area of 560 acres occupied by the Rocket Range is a luxuriant coconut grove.

A former church houses the aerodynamics laboratory; what was once the Bishop's House has become the electronic development section.

Thumba represents international collaboration in space science. It is the only centre in the world where space scientists from the United States, the Soviet Union and France have worked together on a rocket base. The Station participated in the programmes of the International Quiet Sun Year and the Indian Ocean Expedition.

[turn to PAGE 47]



A technician at work at the Space Science Technology Centre at Veli Hill near Thumba. In the casting chambers the propellant mixture is prepared.

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And in the Indian market, their Buyers and Tasters also play a vital role—that of ensuring the right quality for your cup of tea. In order to do this, Brooke Bond's Senior Tasters

sample thousands of lots from thousands of gardens. (There are about ten thousand tea estates in India which produce different types of tea, varying in quality, from week to week).

All these different teas have to be carefully tasted and valued before the buying begins. The advantage of tasting and valuing each tea is that the Buyers know what types of tea and how much of each to buy. Then, from this balanced stock, several blends are prepared. Quite often, as many as fifty teas have to be skillfully blended to bring you your cup of Brooke Bond tea—tea which is always of the right quality.

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International Co-operation at Thumba

Thumba is unique in another sense. It is the first rocket launching station located on the earth's magnetic equator. In this region the earth's general magnetic field is large. At the magnetic equator the ionosphere has many special features like the electro-jet, a narrow stream of very high electric current; that flows every day in the region of 90-130 kms over the equator. By studying the problems associated with the electro-jet, scientists get a better insight into the process by which weather is affected.

Sounding rockets provide the best means to send up instruments for carrying out such studies. The payload of instruments that a sounding rocket carries records desired information in the environment through which the rocket travels. The payload varies according to the purpose of the experiments it is intended to do and its configuration varies with the nose cone of the rocket.

In early August when we were at Thumba, the station was getting ready for launching rockets sometime in September or October.

TERLS has so far fired 51 rockets from the Thumba range. Of these 45 rockets came from the National Aeronautics and Space Administration (NASA) of the U.S.A. and 6 rockets from the Centre National d'Etudes Spatiales (CNES) of France. The U.S. and France have given other valuable equipment also. Till now the maximum number of rockets fired in a single night has been four.

VAPOUR TRAIL

Nike-Apache rockets which release sodium vapour of a bright orange colour into the sky between 80 and 180 kms help to measure atmospheric winds, temperature, diffusion and turbulence. Special cameras located at Kanyakumari, Palayamkottai, Kodaikanal and Kottayam photograph the trail of sodium vapour.

The U.S.S.R. has gifted an M.T-4 helicopter, a Minsk-2 electronic computer and a Shake Table VUX-7 for vibration testing of pay loads.

An Indian-made rocket is yet to be fired. But in collaboration with Sud Aviation of France, Centaure rockets are being made at Trombay. Already electronic and mechanical hardware is being developed in India.

Complete telemetry systems, recovery systems, transmitters, stainless steel nose cone and a variety of other equipment have been made at TERLS. We saw a

sample of indigenous fibre glass as strong as steel and resistant to heat up to 250°C, which has been tried and tested in flight.

A Space Science and Technology Laboratory will soon rise in the picturesque Veli Hill, close to the Rocket launching station. A propellant laboratory which will form its nucleus has started developing propellents for rockets of Indian design.

A rocket takes off from the launching station at Thumba
Picture : Courtesy TERLS



AROUND THE WORLD WITH SATELLITES

A man at the control inside a room pressed a button. A huge umbrella-like aluminium and steel metal disc held aloft over a tall tower began to rotate—sideways, clockwise and anti-clockwise, and then in a semicircle upward. It was the parabolic antenna (aerial) of the Experimental Satellite Communication Earth Station (E.S.C.E.S.), 12 kms from Ahmedabad, that has been established by the Department of Atomic Energy. The first station of its kind in India, it has received financial assistance from the U.N.

BIRTH OF AN ERA

Three days before we reached there on July 19, the station had become operational. It has linked

India through a global satellite system to the rest of the world.

A new age in global communication was born with the launching of "Early Bird", a communications satellite, by the U.S.A. two years ago. The satellite orbits at a height of 35,000 kms above the equator. Its orbital period is synchronous with the earth's period of rotation of 24 hours and so, to an observer on earth, it appears to stay fixed over the same spot on the earth. With such satellites orbiting at a height of 35,000 kms over three fixed points, it is possible to establish direct visual contact between any two locations on earth.

How does a satellite enable communication? A satellite receives signals sent to it from a ground

terminal, amplifies them, and retransmits them. It can be in contact with many points on earth at the same time. A terminal station in any country would link that country, through a system of synchronous satellites, to the rest of the world. Satellites can transmit television, voice, telegraph, computer data and facsimile.

India's ground station will collaborate with the National Aeronautics and Space Administration of the U.S.A. and use the Application Technology Satellites orbited by them for conducting scientific experiments in communication as well as in meteorology.

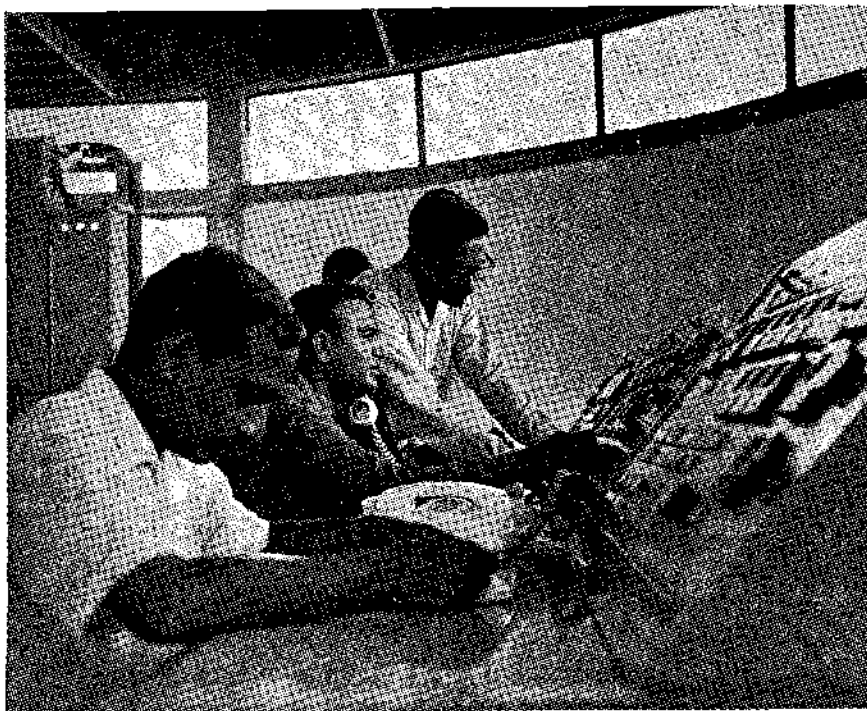
The N.A.S.A. programme is to launch five such satellites with the help of Agena rockets. Four of them will be at a synchronous altitude, that is at 35,000 kms, and the fifth at a lower level. One of the synchronous satellites has already been launched and is over the Pacific. The second, launched in April, failed to go into the required orbit. The third to be over the Atlantic will be launched soon.

The satellites are cylindrical and are about 135 cms long and have a diameter of about 145 cms. Each satellite weighs about 350 kgs.

The ground station can transmit and receive 600 channels of conversation or TV pictures.

AMPLIFYING

The station transmits messages or pictures in high frequency waves of 6,000 megacycles to the satellite. By the time the waves reach the satellite, they get attenuated in the atmosphere. The satellite amplifies them and relays the message or pictures in signals having a frequency of 4,000 megacycles. These signals get weakened and mixed up with electric signals from the atmosphere during their passage downwards. By the time the large ground station antennas, 14 metres



The control equipment at the Experimental Satellite Communication Earth Station, Ahmedabad.

EXPERIMENTS IN GLOBAL COMMUNICATION

in diameter, pick up these signals, they would be very weak. They will only be a billionth of the light waves that come from an ordinary domestic torch. So they have to be amplified. They are passed through parametric amplifiers, which are immersed in liquid nitrogen whose temperature is extremely low. When they come out, they would have been freed from extraneous noises and amplified

10,000 million times. They are then recorded.

Why was Ahmedabad chosen for establishing this station?

It is an important communication centre lying on the coaxial cable route between Delhi and Bombay. Secondly, there is a computer, near at hand, in the Physical Research Laboratory.

This ground station will pro-

vide training and research facilities in satellite communication technology to engineers and technicians from India and abroad. A training college will be opened here in the next two months, which will train 24 people at a time for four months. Engineers from A.I.R., Overseas Communications Service, P. and T., and Defence Services will also receive their training in satellite communication here.

The antenna at the Experimental Satellite Communication Earth Station



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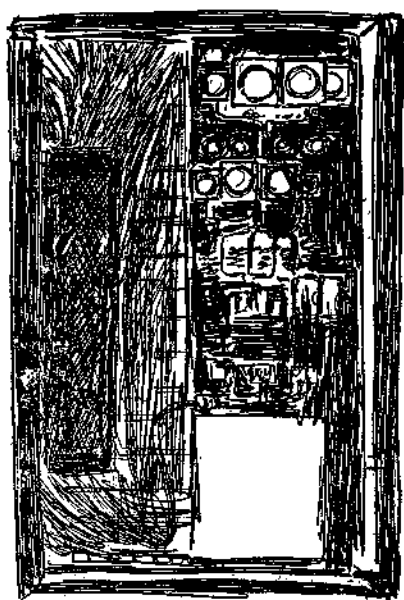


Thanks to the marketing help he received from the co-operatives last year, he could use better seeds and fertilizers this year and get a better yield too. State Bank helped him there with timely assistance through the co-operatives.

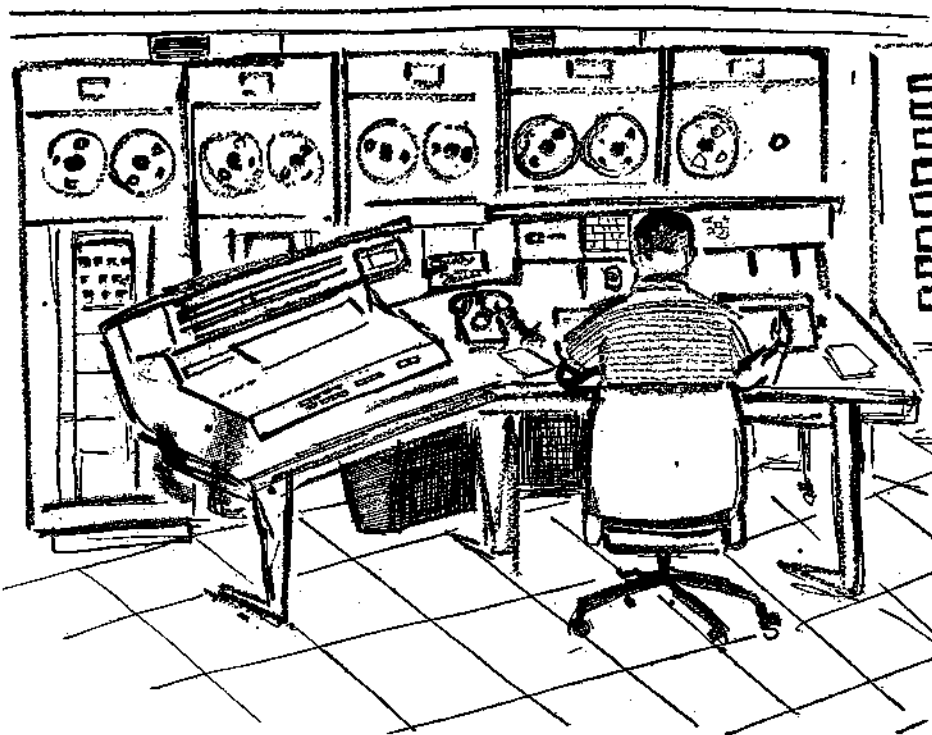
Through 2100 Branches, the State Bank of India and its Subsidiaries extend financial and other assistance not only to the co-operative banks, but also directly to the co-operatives themselves, such as marketing and processing societies, sugar factories, industrial co-operatives, consumer wholesale stores and others.

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Inside a computer.



The console of a computer through which the operator can communicate with the machine

Progress in Computer Technology

THE Tata Institute has the largest electronic computer in India.

Those who operated the computer seemed eminently happy with 'his' (a computer is not a *she*) performance. Everyone spoke warmly about him. Dr. P. V. S. Rao, one of the scientists in charge of the computer, said: "In a second, this computer does 600,000 additions or subtractions and 200,000 multiplications or divisions without committing a single mistake. An average mathematician would take nearly 40 days working round the clock to complete this job. Today this computer works 20 hours a day. He works three shifts. Seventy to eighty organisations—

national laboratories, universities, technical institutes and several others—use him. We charge Rs. 500 an hour for the work."

Speed and Reliability

An electronic computer has still miles to go before it can approach anywhere near the human brain in complexity or capability. It cannot laugh or weep, appreciate music or write poems. But its speed and reliability in doing numerical calculations or solving complex mathematical problems are enormous and far beyond man's capacity.

How does an electronic computer work? It has four main

organs: a control unit, which like the human brain controls the other organs, an arithmetic unit which does the calculations, a memory unit which remembers what it has been instructed to do, as well as store raw data and intermediate results, and an input-output unit which 'reads' the inputs and prints the outputs.

The most intricate and fascinating part is the 'memory'—a labyrinth of wires and cells. Each cell holds a number and a computer has hundreds of thousands of these cells. Any of these cells can be specified by a number and its contents pop out. While a transistor radio consists of only six to

WE CAN MAKE IT TOO

ten transistors, a computer has up to a hundred thousand of them.

"Using computers", said Dr. P. V. S. Rao, "is like teaching a reliable but not very intelligent assistant to do complicated jobs. You first split the problem into very small steps that he can understand and execute." A problem has to be split up and arranged in a scheme of computation which is called a programme. The input quantities are called data. Even the slightest mistake in programming will baffle the computer and produce meaningless results.

The computer's main use is, of course, in solving problems but it has been made to perform some remarkable feats also. We were pleasantly surprised when it was coaxed to sing, "Two little dicky birds sat upon a wall, one named Peter and the other named Paul" The voice was eerie; the words were not clear but it was not the

reproduction of any human voice. Dr. Rao said that a person's lip movements were measured when he sang this song and the measurements were fed into the computer which it converted into electric impulses and recorded on a magnetic tape. The voice was of the computer!

"Can't you make a computer yourself? Why did you import one?" I asked Dr. P.V.S. Rao.

On-line Computer

"We had, of course, designed and made a computer and we are now making another," he said. "The pilot model of our first computer was made in 1957. The main computer was assembled in 1959 without any outside help. Not a single person who had participated in its design and making had any foreign training in computer technology at that time. And

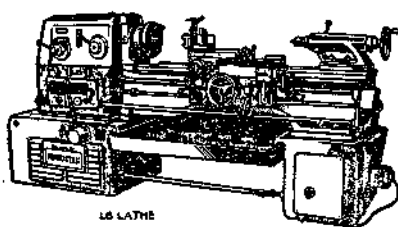
the computer which was named TIFRAC worked for five years till 1964 when the bigger computer came from America. More and more sophisticated and versatile computers come into the market every year. Till we developed one comparable to what will be available five years later, we have to get from abroad. Now we are developing what is called an *on-line* computer."

An *on-line* computer, when connected to an atomic reactor or an oil refinery, automatically directs the innumerable physical and chemical processes and ensures continuous quality control. It measures hundreds of temperatures, pressures and chemical concentrations and operates numerous controls. Such a computer can also be used to study the complicated clinical aspects of people by processing medical data like blood pressure, temperature, and so on.

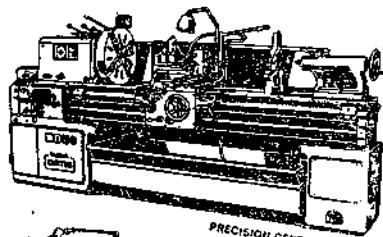
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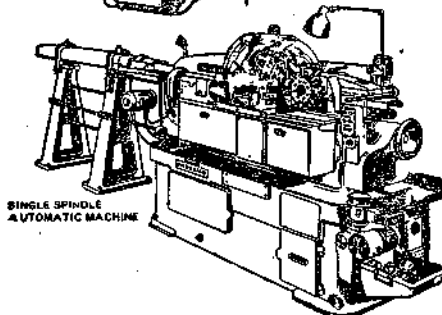
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Scientists check a seismometer that measures earth movements:

DETECTING NUCLEAR EXPLOSIONS

SOME 80 kilometers from Bangalore on the road to Secunderabad is the town of Gauribidanur. Not far from the town is the village of Hossur set amidst hills.

We drove to this village to see the Nuclear Explosion Detection Centre. The village bore no external marks of housing an important centre of scientific study. There was hardly any big building; nor was there much excitement or visible activity.

There is much quiet work done here, though. The Centre can

INDIA'S FIRST STATION

record the minutest shaking of the earth to the accuracy of a part in ten million. Within three days of its being set up in October 1965, it recorded clearly an underground nuclear explosion conducted by the United States of America at Amchitka in the Aleutian Islands some 9,500 kilometers away.

In a fenced area is a red metallic vessel, resembling a wayside post box, raising its head from underground. Encased in the metallic vessel called the clamshell are two small instruments, the seismometer and the amplifier.

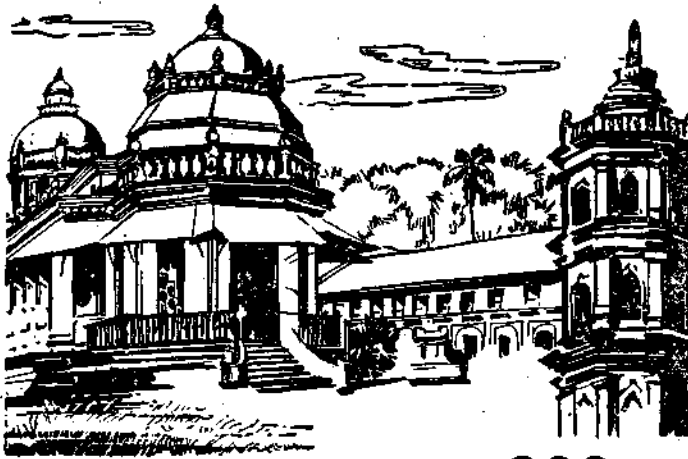
When any geophysical event takes place, the earth moves up or down. An earthquake generally produces a downward movement and a nuclear explosion upward. The earth's movement, even as small as one-millionth of a millimeter, is picked up by the magnet suspended in the seismometer. The signals are then amplified and transmitted through overhead cables to a central recording laboratory. There, the signals are processed and visually recorded on a graph and on a magnetic tape which can run three days continuously. From the graphs and tapes, the

distance, the velocity and direction of any event that has taken place can be determined.

The entire system consists of the seismometers placed inside clamshells at intervals of 2.5 Kms. on an L-shaped pattern. This system is called a seismic array. It can detect any underground explosion or earthquake that takes place within a radius of 10,000 kms.

Of all places in India, why this out-of-the-way village? This is because the place is one of the most noiseless in India. There is no industry nearby and the village is far removed from major transport systems. Both the Arabian Sea and the Bay of Bengal are far away from here. And the Deccan plateau is geologically stable having a continuous bedrock.

A LAND OF PICTURESQUE TEMPLES



The temple of Shri Mangesh at Priol is like a jewel set amidst beautiful green surroundings. The other well-known temples are those of Shri Mhafasa at Mardol, Shri Narsimha at Veling, Shri Shantadurga at Kavlem, etc.

Goa, a land richly endowed by nature, has many attractions for the tourist. With a history that stretches as far back as the mythological era, Goa abounds in picturesque temples, historical landmarks, holiday resorts and lovely stretches of sea shore. When you are planning a holiday, make Goa your exclusive choice.

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SCIENCE HAS TO REACH THE PEOPLE

ROUND TABLE DISCUSSION

A Round Table of Scientists and Technologists was convened in Delhi on September 7 and 8 by the Prime Minister, Mrs. Indira Gandhi. The Prime Minister explained that this was one of the series of get-togethers to allow "fruitful discussion" and also "to keep personal and first-hand contact with the minds of important sections of our people." About 50 scientists from the various research institutes, both official and non-official, took part in the discussions.

In her address, the Prime Minister said, "It is possible to detect a sense of disquiet and frustration in the country's scientific community of which 'brain drain' is not the only manifestation. There appears to be a gulf between science and administration, inadequate contact between science and industry and, in my view, foreign collaboration is still too readily sought."

"Science and Planning also could draw much closer. There is urgent need for more careful and detailed research planning linked to specific needs and time-horizons. We must be sufficiently bold and imaginative in developing and using our own know-how as well as making the fullest use of the experience of others. Above all, we must ensure that the results we achieve are commensurate with our investment."

TEMPER OF SCIENCE

The scientists broke into three panels.

Panel I discussed how to build the scientific temper in the country. It felt that a large number of competent scientists must get personally involved in the task of educating the people on science matters and creating science-mindedness in the country. A basic defect of our science education at most levels, including attempts at popularisation of science, was the emphasis on teaching about the supposed "facts" and "wonders" of science and not the methodology of science.

It suggested that: (i) All science books prescribed should be scrutinised by a competent panel for their correct methodological approach. (ii) Text-books should be written by first-rate people in each region or State. (iii) At the school level, the books need to be translated in terms of not only language but also their 'atmosphere.' (iv) Scientists in universities and laboratories should take part in school science education. Perhaps the best university science students could be asked to teach in primary schools as part of a National Service Scheme. (v) Science journals should be started at school level.

For popularising science among the masses, the panel suggested the production of documentary films, radio talks and popular science journals in English and regional languages. The panel was of the una-

nimous opinion that English had to be taught sufficiently early to all students who intended to go in for specialised or advanced course in science, engineering and technology.

As for science education at the university stage, the panel felt that the funds now available were "pitifully inadequate". It desired that the staff be doubled at a cost of about Rs. 5 crore.

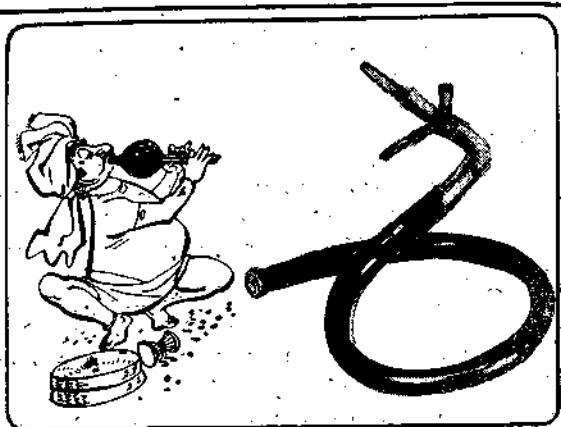
The panel was of the view that every effort should be made to get Indian scientists back to India. It was essential to identify the first-rate Indian scientist abroad and allow him to return, if he so desired, with a team of his own choosing and to a location of his choice where the facilities he wanted should be provided as far as possible. Also a senior scientist in India might correspond directly with someone abroad who would be willing to join his group. The system should be strongly encouraged.

ORGANISATION

Panel II discussed the problems related to the organisation of science in the country. It said, the Scientific Policy Resolution of 1958 should be effectively implemented. The scientific policy-making body, the Planning Commission, the various national institutions for scientific and technological research, the science departments of the Ministries and the Universities, should all form part of an interlocking network of science which, in turn, would become part of national industrial, economic and social activity. The panel suggested the following set-up for integrating the scientific activities in the country:

(1) The Scientific Advisory Committee to the Cabinet (SACC), set up in 1965, should remain the sole body providing top level advice to the Government on science and technology. To make this organisation more effective, it should have a full-time chairman, preferably a professional scientist, and it should include the Member of Planning Commission in charge of scientific research. It should also have a small permanent staff of science analysts and a working group system to tackle specific problems and initiate studies of fields and disciplines in depth.

(2) A National Council for Scientific Research (NCSR) should be set up as a statutory body for the co-ordination and implementation of all the research and development activities of the various scientific departments and organisations within the Government. It should be headed by the Member for Scientific Research of the Planning Commission. In each Ministry having significant scientific and technological operation, a Science Administration Wing should be set up to act as the sole executive machinery for implementing the science programmes of the Ministry. The various Ministerial programmes would be referred



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to the NCSR for financial and technical integration.

(3) A separate Ministry of Science and Technology should be established under a Cabinet Minister. The Ministry should provide leadership and guidance to all Ministries, co-ordinate scientific research in different fields and advise the Government on the implementation of scientific policy.

(4) A National Academy of Science and Technology (NAST) should be set up as a single professional society for science and technology. Such an academy could be formed by merging the four existing professional societies or could be an altogether new organisation.

(5) Science administration should develop an effective system for discovering talent, encouraging innovations and giving opportunities to individuals for better professional performance. The job opportunities and career prospects in science and technology should not be lower than those of other Government services in terms of economic, social and professional benefits.

(6) The universities should be made to work in collaboration with other scientific and technological organisations in the country.

PLANNING AND UTILISATION

Panel III discussed the problems of planning and utilisation of research and technology. It observed that Indian talent in science and technology was of a high quality. There were generally ample opportunities for recognition of the basic research work of scientists. However, special measures would have to be taken to recognise scientists and technologists making contributions in applied sciences.

About foreign collaboration, the panel suggested that it should be resorted to only for the purpose of gaining lead time. In cases where technology of a higher standard could be developed within the country, such collaboration was undesirable. Even in cases where an industry was established with foreign know-how, indigenous research should be made available for advancing the imported technology. It was not necessary to have total turn-key imported technology. Outright purchase of foreign know-how was preferred to royalty.

For the national planning of research and development, the panel suggested, the Bhabha Committee's report on electronics should be emulated. To avoid failures of research projects, studies should be carried out at an early stage covering technical, marketing and economic feasibilities. The final user should be given full information based on reasonable pilot plant studies and adequate surveys. Laboratories should instal pilot plants for defining design parameters and these should not operate as semi-commercial plants.

The total quantum of research and development in the country as a whole is still deplorably low. All efforts should be made to increase it speedily.

There is considerable technical know-how already freely available in the country. Steps should be taken for its wider and efficient application.

DARJEELING (West Bengal)

WEALTH FROM WASTE

ON the outskirts of Siliguri town in the Darjeeling Rural Industries Project, is situated, amidst sylvan settings, a bone meal unit run by an enthusiastic entrepreneur who has cast aside considerations of caste and orthodoxy for undertaking this kind of work.

In a way he has done a pioneer's job in starting this factory in this area. Although it is difficult to stand the stench emitted by the decaying flesh and bones, yet the reward is rich for him and many others associated with this enterprise.

Mr. R.C. Ghatak, 52, Director of the North Bengal Bone Mill and Fertilisers Private Ltd., Siliguri, is not only putting to a commendable use the petrifying bones of dead animals gathered from far flung villages for running a successful business of his own, but is also instrumental in providing direct employment to 40 persons in his factory in the task of collecting bones for his factory.

After passing his Matriculation examination from a school in Mymensingh (now in East Pakistan) in 1931, Mr. Ghatak joined Rippon College, Calcutta, from where he took his B.Sc. degree in 1936 with distinction. He then joined the Imperial Institute of Sugar Technology, Kanpur, in 1937, completing his technology course in 1940 and topping the list of successful candidates. Mr. Ghatak has specialised in the manufacture of sugar, alcohol and vinegar from molasses and malts and beer from cereals. During his 16 years of

J. L. SAAZ

service he worked as a chemist with a number of sugar mills and distilleries at various places such as Moradabad, Rampur, Cooch Behar and Kathmandu. During this period he came into close contact with some Dutch and Russian technologists of international repute and was greatly inspired by their self-imposed discipline, a high sense of duty and a keen desire to improve upon their professional expertise.

When Mr. Ghatak decided to set up his own enterprise he was drawing a monthly salary of Rs. 1400 at Kathmandu as the manager of a distillery. "It was no easy job to throw away a lucrative job and go in for a business enterprise when things were uncertain and the family burden rather heavy, for," as Mr. Ghatak explained, "I had to support my brothers, mother and sisters who had crossed over to India in recent past leaving all their belongings in Pakistan." The prevailing taboos and the orthodox family set-up did not give much encouragement for the kind of enterprise he was contemplating. But finally he decided to take a plunge and in partnership with a Russian technologist and friend, late Ivan Stepanovich Nicoln, he started the present enterprise in 1950 as a private limited company. With their own resources and the financial assistance received after great efforts and much delay from the Industry Department of the West Bengal

Govt., they set up a fine unit which now involves a fixed capital investment of about Rs. 70,000 and a working capital of Rs. one lakh. The unit started with direct employment of 10 persons and has now on its rolls 40 employees. Its production which in the initial stages was of the order of 300 tonnes has now almost doubled. They have a regular contract with a firm to supply crushed bone-meal and there is no dearth of demand. Apart from preparing bone meal for use as a fertiliser, the unit exports grit which is utilised for the manufacture of gelatine. Being the only one of its kind in the area, the unit has given a spurt to bone collecting activities in the surrounding villages where groups of bone collectors have cropped up and found a gainful occupation all through the year.

Mr. Ghatak is not satisfied with the crushing of bones alone. He has plans to expand his business activity by undertaking some more manufacturing operations such as manufacture of glue from sinews which at present are not properly utilised, as also the establishment of granulated mixed chemical formulations and insecticides and pesticides. He is studying the financial and technical implications after which he will finalise his plans. At present the immediate requirement of the unit is electric connections and some machinery—a rotary grading machine and a weighing bridge.

RURAL INDUSTRY



A YOJANA SUPPLEMENT

A FARMER'S PIONEERING ENTERPRISE

R. D. HATEKAR

THE village Savangi (Meghe), near the second mile-stone on Wardha-Yeotmal road, is like any of the 12000-odd villages of the Vidarbha region of Maharashtra. In recent years a number of small industries have sprung up in the vicinity of Savangi, holding a promise of change in the life of the local people. Padma-Kripa Industries, manufacturing poultry equipment and steel furniture and started under the Wardha Rural Industries Project, is one of the more successful new enterprises.

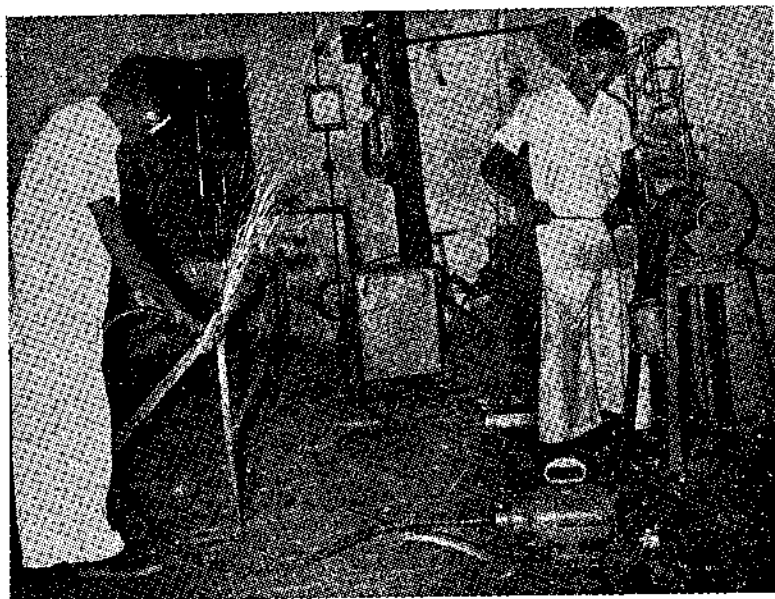
The enterprise owes its success to the untiring efforts of a farmer, popularly known as "Dr. Raosaheb Kaley," and his eldest son Chintaman (Chandoo). In 1963, Raosaheb Kaley started poultry as a side business on an experimental basis. He soon discovered to his dismay that the poultry equipment he used was defective in design and manufacture. Determined to make good his losses he hit upon the idea of improving the instruments to remove their defects. The designs of the improved instruments were prepared and the "Doctor" decided to undertake manufacturing operations himself on a modest scale. But how to solve the ticklish problem of capital? About this time he heard about the Rural Industries Project. Kaley presented a detailed scheme of his own to the Project authorities, and a loan of Rs. 10,000 was sanctioned. He added to this amount his savings of Rs. 3,500; and in 1964 the Padma-Kripa Industries started producing improved poultry equipment and steel furniture. Today, they are manufacturing power-

operated breeds, incubators, and a number of other items.

The unit has received orders for poultry implements from quite a few modern poultry farms. The Chief Minister of Maharashtra praised the quality of the products in the Agro-Industrial Exhibition held in 1965-66, and the entrepren-

immediately switched over to the steel furniture in the production of which galvanised metal sheets could be done away with. The unit now manufactures steel furniture for hospitals, maternity homes, schools, colleges and libraries. Their products range from paper-stands to steel cupboards and from office furniture to show-cases. Like the poultry implements this furniture is also in good demand. The turnover of the unit increased from Rs. 23,000 in 1964-65 to Rs. 47,000 in 1965-66, and 78,000 in 1966-67.

Kaley's eldest son Chintaman, an imaginative and enthusiastic young man, has now taken over the responsibility of the business from his father. Chintaman Kaley was among the 36 industrialists who visited various industrial centres of Maharashtra in a study tour organised by the Rural Industries Project, Wardha, last year. The tour gave this enterprising



At the Padma-Kripa Industries, Wardha. The picture shows two workers at work in the grinding section of the Industries' workshop

eur was awarded the first prize by the then Defence Minister, Mr. Y. B. Chavan.

Blessing in Disguise

Months ago, the galvanised metal sheets became scarce. In view of this raw material scarcity, the Padma-Kripa Industries

young man some new ideas. He intends to set up a forging plant to manufacture sophisticated agricultural implements. In fact, he has already started the production of agricultural implements, and will go in for the sophisticated production as soon as he receives the requisite financial and technical assistance.

COMMON FACILITIES FOR OVERHAULING MARINE ENGINES

G. K. PANIKKAR

BEYPORE, about 9 km. to the south-west of Kozhikode, is a natural harbour. There is a small port and there are various plans to develop it into a full-fledged harbour. Recently a fishing harbour has been set up here. There is a Fisheries Training Centre, where training is being given to selected workers in deep sea fishing. After the training, small fishing vessels fitted with marine engines are given to the trainees on hire-purchase terms by the Fisheries Department. A good number of vessels have been so distributed.

Beyport has been famous for boat building industry. A number of engineering workers in this area are engaged in the overhauling of marine engines. Recently a co-operative of these workers has been organised. But these engineering workers do not have modern equipment and machines for the efficient discharge of their jobs.

A survey of the resources and needs conducted by this Project, before initiating the programme, revealed the scope and necessity for establishing a common service facility centre for these workers. The establishment of the centre was thus taken in hand and it started functioning from January this year.

Ideally located between the Beyport and the fishing harbour on the bank of the Beyport river, this centre has been set up by the Project with a fixed investment of Rs. one lakh. Besides undertaking the overhauling of engines, the centre with its modern machines can manufacture precision spares required by marine diesel engines.

From April 1967, the centre has been placed at the disposal of

the Beyport Marine Engineering Workers' Cooperative Society which is now making the best use of the centre under the guidance of its very active and able secretary, Mr. Subramonian. The society is manufacturing items such as rudder shoes, rudder fork and shaft, pistons, sleeves, piston rings, besides overhauling and fitting of diesel engines. At present eight workers are regularly employed by this centre.

A WORKER'S DREAM REALISED

MR. P. Madhavan had been a skilled worker in an engineering firm in Feroke area. He has acquired considerable skill in casting, and also in the manufacture of various machines. His life's ambition had been to set up a unit of his own. By the middle of 1964 he approached the Project with his scheme. But he had neither finance nor land for setting up a factory. He was advised to hire a suitable building in Cheru-

vannur, near Feroke, where there were a number of tile factories. Early in 1965 he had set up the engineering unit involving an investment of Rs. 45,000. The Project supplied him machines—two heavy duty lathes, one vertical drilling machine and a planing machine—worth over Rs. 28,000 on easy hire-purchase terms.

The unit, which also has a foundry and a casting section, provides employment to 21 persons, including the entrepreneur and his two brothers. It is manufacturing all kinds of tile factory machines such as pug mills, conveyors, various types of dyes, and match factory machines such as chopping machines, cutting machines and peeling machines. In addition to these, it manufactures pump sets, iron grills and gates, spare parts of various machines, and attends to general engineering jobs in the area. Two match splints manufacturing units sponsored by this Project have purchased all their requirements of machines from this unit alone.

ALLEPPEY (Kerala)

FORMER FILM WORKER SETS UP A METAL INDUSTRY

T. SUDHAKARA MENON

MR. V.K. Shenoi, formerly a film technician in Bombay, was interested in starting some useful industry in his home town. He was given technical guidance and financial assistance by the Project authorities at Alleppey which enabled him to set up, in 1965, a unit for the manufacture of anodised aluminium fittings. The unit—Actine Industries, Pattanakad—is now a leading manufacturer of

etched metal labels, anodised aluminium labels, anodised hardware items, novelty articles and fashion jewellery in the Project area. It is a well-equipped unit with an anodising plant, a drilling machine, a polishing machine, a fly press, and a circular saw. The Project provided over Rs. 18,000 for procurement of this machinery.

The unit, which went into production in January 1966, has now

a monthly average production of Rs. 3,000. It provides regular employment to three skilled workers, besides seven trainee-workers. The industry has good prospects as there is demand for anodised aluminium fittings throughout the State. The entrepreneur intends to equip the unit with additional machinery for which purpose he has applied for a fresh loan of Rs. 10,000 to the Project authorities. The unit has been receiving technical advice from the Small Industries Service Institute, Trichur, and job works from the Government of India, Extension Centre, Thumpoly.

A FISH CANNING UNIT

AMONG the resource-based industries started in the Alleppey Project area, fish canning may be mentioned as an important one. Palpoo Arayan Industries, Purakkad, has made a mark in this field. The unit is suitably located on the sea-shore and there is direct access to the sea from the site through a road, about a furlong in length. The abundance of prawns available in the locality during certain periods of the year is being made use of profitably in this unit.

The total investment on the unit comes to about Rs. 1.5 lakh covering the cost of land, building, machinery, water supply, pipe system, electric connections etc. Out of this, the Project advanced a loan of Rs. 38,500 for construction of the building, and Rs. 15,000 towards hire-purchase of machinery. The factory employs twenty trained women workers and ten men workers of whom six are skilled in various jobs. There is also a technical adviser in overall supervision of the work.

The factory which started functioning on 1st April, 1967, has a production capacity of 5000 tins of 4½ oz. per shift. The product is graded into different varieties such as 'colossal', 'jumbo', 'large', 'medium', 'small', 'tiny', and 'cock-tail', according to the size of the prawns. About fifty boats are engaged in fishing in the locality during the peak season. The number of shifts in the factory depends on the availability of fish. The product offers good promise to earn foreign exchange by exports.

TARIKHET (U. P.)

FIBRE FROM SISAL

M.B.L. SRIVASTAVA

RAMBANS is the local name of sisal plant which grows wild in this Project. It is estimated that about 20,000 quintals of Rambans leaves are available in this area annually. These leaves have fibre texture used in the making of twine and ropes, the length of fibre differing from 12 to 36 inches. Fibre is extracted after removing green portion of leaves. Green portion is soapy in nature and its solution is used in washing clothes. Fibre itself can be washed with this solution.

Rambans is of three varieties : (i) Agave Royalana, (ii) Agave Americana, (iii) Agave Sesalana. In this area mostly Agave Royalana is found. This variety gives fibre of short and medium lengths. The other two varieties are known for long fibres. Plantation of Rambans on scientific basis is still unknown in this area. Some preliminary work for taking up plantation of Sesalana has been done by the Soil Conservation Division of Forest Department at Ranikhet, and on its success it might be extended to other catchment areas of river Ramganga.

The Ship Ancillary Industries Committee, Bombay, which assessed the demand for fibre for overboard marine ropes, estimated that the six factories in this industry can purchase about 50 thousand quintals of fibre annually. The locally available fibre was got tested and was found equivalent to an inferior grade of imported fibre.

One entrepreneur, Mr Bhairav Dutt, who is a science graduate, was encouraged to set up an industrial unit at Tarikhet for processing of Rambans fibre. He was given an industrial loan of Rs. 5,000 and an industrial grant of Rs. 400. His father Mr Ram Dutt Pandey,

Pradhan of the Gaon Sabha, was the driving force behind this enterprise. Mr Pandey had, in the course of his internments during the Independence struggle, learnt about extracting fibre from Rambans leaves, making twines from fibres and washing clothes with its green substance. The work was done by hand process and involved strenuous labour intended as an item of work of rigorous imprisonment. That bitter experience served Ram Dutt Pandey in establishing a factory at Tarikhet for extracting fibre and making twines and ropes. The factory is equipped with a scrapper for extracting fibre from leaves, twine making machines, carding machines (all power-driven), and a rope making machine (hand driven).

Green leaves are purchased at factory site at Re. 1 per 40 kgs, and this has provided subsidiary income to several women and students who cut leaves on their way to market or school and sell at the factory. Fibre is extracted from these leaves with the help of the power scrapper. Three to four kgs of fibre are obtained from 40 kgs of leaves. Half of this fibre is good and the remaining half is tow which has to be carded before being spun. The carded fibre is given to local persons who are paid at Re. 1 per kg of finely spun yarn. Good and unbroken fibre is used in making twine with the help of power machines. Ropes of 4-ply are made with the help of hand-driven machine. There is no difficulty in selling twines and ropes locally at rates varying from Rs. 2.50 to Rs. 4 per kg. The factory has been sending its first quality fibre to a marine rope manufacturer of Calcutta, utilising itself fibre of second quality in making twine and ropes.

In view of general scarcity of labour force and high wages in this area, the scope for development of twine and rope industry is rather limited. But there is good scope for extraction and supply of Rambans fibre to marine rope manufacturers. It is, therefore, proposed to encourage about a dozen units (at places where Rambans is abundantly available) in installing fibre-extracting machines. This will not only help in useful utilisation of an unused resource but will also result in foreign exchange savings.



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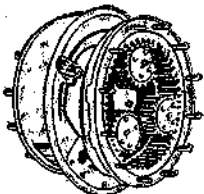
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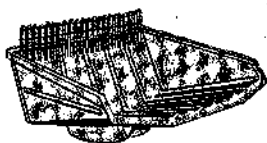
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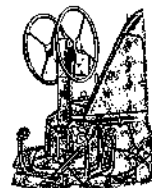
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TIME TO ACT

THE prospect of a good crop is not enough, it seems; for while a bad season restricts the problem largely to finding the grain elsewhere, a good harvest raises new controversies.

The Planning Commission's emphasis is on the large measure of agreement at different levels. The task now is, as Prof. Gadgil underlined, to translate this policy into action. "The crux of the problem", he said, "is individual decisions by way of implementing the policy."

This is important. Unless the decisions of the Chief Ministers are backed "by an urge to act", the chances are that "we may slip up". The nation's immediate concern is that the asset of a good crop is not frittered away by tardiness and complacency.

Over procurement, there is little disagreement. The effort must be to fulfil at least the targets suggested by the Agricultural Prices Commission. There is, of course, the price question.

Here, again, nobody suggests that a good harvest should lead to a depressing of the producers' margin. In fact, the Planning Commission is for defending the procurement prices of last year. This, in spite of the fact, that a good crop coupled with a shortage of ready cash with bulk buyers, may tend to sag the market. The Commission has also pleaded for a prior commitment of a single set of prices for procurement throughout the year, so that the producer may not be at a disadvantage.

Procurement prices must bear some relation to distribution rates. An increase in one cannot but lead to a step up in the other and this is not exactly how the price line can be held. Nor is this the only problem. Higher consumer prices of food will push up the cost of living index to an extent that further reliefs have to be provided to the fixed income groups. And since the States are as committed as the Centre is to giving these reliefs, they will have to think of the price problem in all its budgetary and developmental consequences.

Nor is it true that procurement has a direct relation to prices. In fact, in the initial months of harvest, procurement acts as a support to the producer. This is already the experience in some of the areas where the grain has been harvested. Therefore, effective procurement in the early months will settle the price problem as much as it will remove the farmers' worries.

In any event, the country cannot let little controversies shroud the essential task of getting the best of this first good crop in three years. Yesterday was bad. Tomorrow is uncertain. Let us act in the present which is good, so that the past may be compensated and the future may be assured.

And when we are still amidst a bountiful harvest, we should be able to plan the long term policy about socialisation of food trade and processing, strengthening of the Food Corporation and about co-operative credit and marketing. When this is done and when Government has acquired and stabilised a commanding position in the market, one can think of removing the movement restrictions.



The economic development of the countries which have emerged into freedom has necessarily to be the concern of advanced nations also. These nations had benefited from the exploitation of the resources of the vast areas over which they ruled for two centuries. Equity, therefore, would demand that in matters like trade the advanced countries play a constructive role in the speedy growth of the economies of the relatively less advanced countries.

The problem is bound to come up in a big way at the second UNCTAD to be held in New Delhi early next year. Some lines of action by this international gathering are indicated by Mr. Dinesh Singh (pages 2-3).

The relevance of Dr. Lohia's ideas on matters like incomes and urban consumption is discussed on page 4.

In the context of the controversy over bank nationalisation, B.S. Padmanabhan gives background information on the present banking law (pages 5-6).

The possibilities of Indo-Ceylon economic collaboration are discussed by M.K. Dharma Raja who covered the P.M.'s visit to the Island (pages 7-8).

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FRAMEWORK OF A WORLD TRADE POLICY

The second UNCTAD—the biggest international conference outside U.N. headquarters—is to be held in New Delhi from February 1, 1968. About 2,500 delegates from 132 countries are expected to take part in the conference.

Preparatory to this, the meeting of "The 77"—representing the developing countries of the world is being held in Algiers from the 10th of this month. The Union Commerce Minister who is leading the Indian delegation has referred in this article to some of the problems which are bound to come up at Algiers and later in New Delhi.

DINESH SINGH

FOR over two centuries the bulk of the developing world had laboured under colonial domination. It suffered foreign exploitation of unimaginable magnitude. Some of these countries, now called developing, were historically reputed as leaders in commerce and in industry and provided the resources for the rapid economic growth of those countries which later became their masters. Such has been the cruel course of history. It is, therefore, only equitable that these developing countries are now given assistance by their erstwhile colonial rulers.

Today there is general consensus that the economic development of the developing countries is not only their problem but is equally the concern of the developed countries. During the current decade, many significant declarations have been made to try and translate this realisation into practical measures. The 1961 Resolution on Development Decade, adopted by the U.N. General Assembly, was perhaps the first step towards the appreciation of this obligation by the world community. Three years later, by adopting the Final Act of the first UNCTAD, the international community gave to itself the framework of a new international trade and development policy for directing a conscious programme against poverty more systematically and more effectively.

The growing involvement of countries, at different stages of economic growth and having different socio-economic systems, in the economic development of the developing countries has stemmed from two main factors. Firstly, it has been realised that the United Nations cannot succeed in its objective of turning swords into ploughshares until the economic disparity among nations is first narrowed and then eliminated. We have all become alive, as never before, to the threat to world peace and security posed by the existence in our midst of unfettered prosperity on the one hand, and abject poverty on the other. Secondly, recent experience has shown that further sustenance to the growth and prosperity of the richer nations can be provided only if the poorer nations are allowed their share in prosperity. Prosperity like peace, is indivisible and a pocket of poverty in any part of the world is a threat to prosperity everywhere.

World opinion has already undergone a change since the first UNCTAD. The heresies of yesterday have become the main talking points of today. Only a few years before the first UNCTAD, rigid adherence to the Most Favoured-Nation principle did not permit any exception being made in favour of the developing countries. The first UNCTAD adopted the principle of recognising the need for making a departure from the MFN clause in favour of developing countries. But on the more positive and practical side, there is still no agreement on the granting of preferences to developing countries by developed countries, although, in the last three years, there have been some changes in policy emphasis on this subject in some countries.

Australia is already implementing a scheme of preferences in favour of the developing countries. The United States has also declared her intention to consider subscribing to a scheme of generalised non-discriminatory preferences. The socialist countries have, of course, been on the side of the developing countries on this issue all along.

TRADE CONCESSIONS

Another concept that has undergone a change is the rule of strict reciprocity in trade negotiations with developing countries. Both the relevant UNCTAD principle and Chapter IV of GATT now provide for trade concessions to be extended to developing countries on a non-reciprocal basis. One of the reasons why the developing countries looked forward to the Kennedy Round negotiations with some expectation was the opportunity that it provided for the practical

application of this principle. Indeed, the Kennedy Round has resulted in some, but only some, trade concessions being extended to developing countries.

The Agreement on some basic elements of an International Grains Arrangement is another significant development in the context of the Kennedy Round negotiations. The size of the Food Fund that is envisaged under this Agreement is much below the expectations of developing countries and not at all commensurate with the magnitude of the problem of hunger in the world. Still it represents a major step forward in the field of international co-operation.

The socialist countries of Eastern Europe have made welcome and much-appreciated efforts to turn the potentialities of the unique features of their socio-economic system to the benefit of the economic development of the developing countries. Most of them have achieved, and some of them have even over-reached, the target unilaterally announced by them at the first UNCTAD for the import of certain primary products from developing countries.

A large number of these countries have also removed duties on imports from developing countries. In the new Trade Agreements between individual socialist countries and developing countries and in the modifications introduced in the existing Trade Agreements, there has been an active implementation of the UNCTAD recommendations on bringing about a new division of labour in the world in harmony with the needs of the developing countries. These agreements have resulted in the setting up of industries on the basis of partial division of labour and in an increase in the share of manufactures in the total exports of developing countries to socialist countries. In many cases,

YESTERDAY'S HERESIES ARE TODAY'S TALKING POINTS

KENNEDY ROUND CONCESSIONS MARGINAL

arrangements have also been made for the repayment of credits by the output of industries set up with these credits.

In spite of these developments by individual countries, the economic conditions of the peoples in the developing countries have not only not improved but sometimes deteriorated in comparison with progress made in developed countries. The progress on each single recommendation made by the first UNCTAD has been halting, slow and almost negligible. This is why we say that the present situation tends to widen the gap between the rich and the poor.

Tariff concessions extended to developing countries under the Kennedy Round negotiations have been on a very limited scale and of a marginal nature. No worthwhile effort was made, in these negotiations, for the removal of non-tariff barriers to the exports of

developing countries. And finally, the ground rules of the Kennedy Round did not even admit of the consideration of some of the structural problems standing as an obstacle in the economic development of the developing countries, such as inherent cost disadvantages of these countries, and their inability to find increased access to the markets of the developed countries on account of the latter's protectionist policies.

LOGICAL STEP

It is, however, a matter of some gratification, that there has been a growing appreciation of these problems during the last few years by the developed countries which have shown willingness to consider specific proposals for resolving them. It is my earnest hope that the developed countries will find time from their preoccupation with their own economic problems to address themselves to these unfinished tasks purposefully and speedily. I also hope that the progress recently made in arriving at an agreement on the principle and in working out the various details of schemes for preferences to developing countries would embolden the developed countries to take the next logical step of launching a scheme of preferences without further delay.

Recently, we have witnessed a new wind sweeping over the entire socialist world and resulting in new experiments being carried out by them in the economic and commercial fields. There is appreciation, all round, that these experiments are likely to be conducive to the growth and prosperity of the world as a whole and hence of the developing countries as well. I can only emphasise that efforts will have to be made to enable the developing countries to take advantage of these developments and of this new system of economic management in the socialist countries.

Even if practical results have so far been few and far between, the new trading policy of UNCTAD has brought to the attention of the national policy-making authorities the urgency of seeking fresh solutions to the problems of the developing countries. Many developed countries, whether with centrally-planned economies and/or with free market economies, have made assistance to developing countries an integral part of their national economic policies. And it is hoped that this is not a fleeting phenomenon or a temporary departure forced by circumstances. We believe this aspect of policy has come to stay. But each delay in tackling the problem of poverty makes it all the more difficult and intractable, and the need of the hour is to let this aspect of policy-dominated Government decisions so as to yield quick results to the benefit of both the developed and developing countries.

Perhaps I have been over-optimistic in analysing the steps taken by other countries for solving the economic problems of the developing countries. This is because it will be suicidal for anyone to do otherwise in dealing with this crisis of rising expectations and diminishing fulfilments. Besides, those of us who have the privilege to participate in this great debate of the century on how to lay the foundations of enduring peace against very heavy odds, have no choice but to be incorrigible optimists.

WHERE IS THE AGE OF FUNDAMENTALS ?

IF Dr. Lohia was guilty of sparing the causes and spoiling the result, have others done better? Many in India thought that the British withdrawal, followed by the adult vote, would lead to the sovereignty of the people, whereas it has largely led to the privilege of the elite. And planning in India, with all its understanding of the role of the expanding public sector and of the growing heavy industry, admittedly, has taken us nowhere near socialism. Even if the poor have not become poorer, the disparities have increased and the entrenched classes have entrenched themselves further.

Attacking the causes, therefore, is not as easy as it may seem; it is not merely the understanding but the method that provides the answer. There is only one method which will abide. The people must be made aware of where the threat comes from. Without this awareness, they will lose the battle every time as they have lost the battle in India so far.

Dr. Lohia's great contribution to Indian political action lay in his ability to promote this awareness. His three annas-fifteen annas controversy did a lot more to arouse people's awareness than volumes of dialectical dissertation. In raising this he was not attacking the symptoms but was clarifying issues in a manner people can understand.

If one sought only to go to the causes and remedy them without a commensurate public understanding of the processes of socialist action, one would soon find oneself outsmarted by the classes who can always confound the people with slogans of transient popular appeal. That, in a measure, was Nehru's tragedy. Soon every institution which he created to protect the people became an instrument of the entrenched sections.

Banner of Revolt

From this premise Dr. Lohia built his philosophy of debunking. Here, too, he was fundamentally concerned, not peripherally occupied. "You have to liberate the people from the imprisonment of established ideas before you can take them forward," he used to say.

In economic matters, he limited himself to a few issues. He was for a limit to incomes; he argued against ostentatious urban spending. While he was for modernised production, he was against modernised consumption; that is,

he raised his banner of revolt against the huge structures of Delhi, the car and the refrigerator.

Much of this seemed irrelevant, odd and superficial. Yet he was going to the core of the matter.

He was not cavilling at the urban upper middle class prosperity. His was a deeper concern. The complacent approach to incomes and urban consumption flowed from a system whereby planning, instead of becoming a people's movement, was reduced to an "exercise" in "projections" and "perspectives" by a few experts. The "efficient" idea, without the continuous backing of people's participation, was bound to result in compromises and adjustments to suit the pressures of the parasitic urban upper middle class. The public sector has remained the bureaucratic sector, not the people's sector. How will anyone effectively meet the criticism that between monopoly and State capitalism there is little to choose? And is it not true that the elite of Delhi has had a lot more to do with our politics and economics than the vast masses of this country, the intelligentsia not excluded?

Not Expertise Alone

Only those who speak of growth rates, returns, inefficiency and the rest seem to be occupied with the symptoms. If one were really to trace performance to first causes, one would find that the basic weakness was in insulating planning from the people. Wiping every tear from every eye is not done by expertise alone. Gandhi said, "Whenever you are in doubt, think of the poorest man in the country and ask yourself if what you do is of any benefit to him."

This advice does not mean that we reject efficiency; what it does mean is that efficiency should always be subject to the people's needs. If this had been so, we would not be talking knowledgeably about "recession", "demand and supply" and a "glut" in cement and steel when people are languishing for want of houses, hospitals and schools; nor would we be speaking of a shortage of nurses and doctors when so many of our young men and women despair of doing anything worthwhile.

It is a poor way of honouring a man's memory to ask that his ideas be accepted after his passing. But it is worse not to consider if, after all, he might not have been right.

—R.K.

BANKING LAW IN INDIA

B. S. PADMANABHAN

This brief article sums up the powers which the Reserve Bank has under the existing law to control the conduct of banking business in the country.

THERE has been a demand for nationalisation of banks for quite some time and more recently, this issue has come to the fore following the resolution adopted by the All India Congress Committee. The advocates of nationalisation contend that commercial banks have by their operations helped concentration of economic power and creation of industrial monopolies. It is also alleged that the resources of the banks are used more for the benefit of the Directors and the companies in which they are interested than for new entrepreneurs or small industrialists or farmers.

The Indian Banks' Association, on behalf of the management of commercial banks, has refuted these charges and given figures to show that advances to Directors constitute only 10 per cent of the total advances. The banks have also pointed out that the Reserve Bank exercises a good deal of control over them and whatever has been done by them has the approval and concurrence of the Reserve Bank. Those in the Government, who do not favour nationalisation, also argue that there is sufficient social control over banks even now. In this context, an attempt is made in this article to point out the actual provisions that exist for control over banks.

The working of banks in India is governed by the Banking Regulations Act of 1949. Previously it was called the Banking Companies Act, but with co-operative banks coming into its fold, the title was changed. There are 56 sections of the Act of which only the last one deals with co-operative banks. All the other sections provide a series of "dos" and "don'ts" for commercial banks. There are as many as 15 sections which, in one way or the other, deal with the Reserve Bank's control over the banks.

Since one of the main points of criticism against the banks relates to the use to which the resources of

the banks are put, let us first see the nature of control contemplated in this regard. Section 19 takes care of intercorporate investments of the banks. It prohibits banking companies from forming any subsidiary company except for (a) undertaking and executing of trusts, (b) undertaking administration of estates as executor, trustee or otherwise, (c) providing safe deposit vaults, or (d) carrying on banking business outside India with the permission of the Reserve Bank.

This section also prohibits banks from holding shares in any company to the extent of more than 30 per cent of the paid-up share capital of that company, or more than 30 per cent of its own paid-up capital, whichever is less. Further, under this section, no bank can hold any share in a company in the management of which any of its Managing Director or Manager is in any manner concerned or interested.

The next two sections deal with restrictions on loans and advances. Under Section 20, a bank is prohibited from giving loan or advance on the security

DOES IT GUARD PUBLIC INTEREST ?

of its own shares. A bank cannot grant unsecured loans or advances to any of its Directors or to a firm or a private company in which any of its Directors is interested as partner or Managing Agent or guarantor, or to any individual in cases where any of its Directors is a guarantor. This section further says that no bank can grant unsecured loans or advances to any company in which its Chairman is interested as Chairman or Managing Director or Managing Agent or as a partner of the Managing Agent.

This section, however, does not preclude grant of unsecured loans to joint stock companies in which any of its Directors is interested as Director or Managing Agent or guarantor. To take care that this is not misused, it is laid down that in all such cases, returns showing full particulars of unsecured loans and advances granted should be submitted every month to the Reserve Bank. If the Reserve Bank finds that these

loans and advances have been made to the detriment of depositors of the bank, it can prohibit grant of further loans or advances or impose such restrictions as it may think fit and can also direct the bank to secure repayment of the loans or advances within a stipulated period. It is also laid down that no bank can remit, without the Reserve Bank's approval, any debt due to it from any of its Directors or from any firm or company in which any of its Directors is interested as Director, partner, Managing Agent or guarantor, or from any individual if any of its Directors is a partner or guarantor.

Under Section 21, the Reserve Bank has been empowered to determine the policy in regard to advances and loans to be followed by banks in general and by any bank in particular. The banks are bound to follow this policy. The Reserve Bank can also give directions in regard to (i) the purposes for which advances may, or may not, be made; (ii) the margins to be maintained in respect of secured advances, (iii) the maximum amount of advance or other financial accommodation that can be made by any bank to any one company, firm, association or persons, or individual; (iv) the maximum amount up to which guarantees may be made by a bank on behalf of any one company, firm, association of persons, or individual; and (v) the rate of interest and other terms and conditions on which advances or other financial accommodation may be made.

Thus, it will be seen that in the matter of grant of loans and advances, the banks cannot do anything without the Reserve Bank's knowledge or approval. But, the criterion on which the Reserve Bank is required to look at unsecured loans under Section 20 (3) is "interest of depositors", and not from the point of view of whether it accentuates concentration of economic power. In laying down the policy for advance under Section 21, however, the Reserve Bank is required to take into account both depositors' interests and public interest. What constitutes 'public interest' may, however, be difficult to define and may be a matter for interpretation.

CONTROL ON MANAGEMENT

Of the remaining, there are at least ten sections which control the management of Banks. Section 12 (2) puts restrictions on the voting rights of any one individual shareholder to one per cent of the total voting rights of all the shareholders. Section 12 (4) requires every Chairman, Managing Director or Chief Executive Officer of a bank to furnish to the Reserve Bank full particulars of the extent and value of his holding of shares, whether directly or indirectly, and any change in the extent of such holding or variation in the rights attaching thereto.

The banks are prohibited under Section 16 (1) from appointing as Director any person who is Director of another banking company. Similarly no bank can have as its Director any person who is Director of companies which, among themselves, are entitled to exercise voting rights in excess of 20 per cent of the total voting rights of all shareholders of the bank. This guards against common Directors and consequent misuse of bank by the Directors for the benefit of

their other companies. This also seeks to prevent any bank aligning itself closely to any one or two business groups in the guise of investment companies. The Reserve Bank has been empowered under Section 35 B to have a voice even in regard to appointment, reappointment and remuneration of Managing Director or any other Director or Manager or Chief Executive Officer of a bank. The banks have to get the approval of the Reserve Bank in this regard.

In public interest, in the interests of depositors and in order to secure proper management, the Reserve Bank has power under Section 35 A to issue any directions to a bank. Further, it is empowered under Section 36 to depute its officers to watch the proceedings of any meeting of the Board of Directors of a bank and appoint its officers to observe the manner in which the affairs of the bank are being conducted. This is in addition to the powers under Section 35 to inspect the books and accounts of any bank at any time. If on the basis of the inspection report of the Reserve Bank, the Central Government finds that the affairs of the bank are being conducted to the detriment of depositors' interests, it may prohibit the bank from receiving further deposits and direct the Reserve Bank to initiate action for winding up the bank.

The Reserve Bank has also wide powers under Section 36 AA to remove any Director or Chief Executive Officer or any other officer or employee of a bank in public interest or in the interests of the depositors, or to secure proper management. In such cases the Reserve Bank can appoint its own nominees in place of those removed. Under Section 36 AB, the Reserve Bank can appoint additional Directors. The number of such additional Directors should not at any time exceed five, or one third of the maximum strength fixed for the Board.

The Reserve Bank has powers under Section 24 to vary the liquidity requirements or to impound the deposits in the form of additional reserve requirements.

It can thus be seen that the provisions in the Act are aimed at protecting the interests of depositor and at preventing any misuse of the funds of the commercial banks. If, in spite of these provisions, it is proved that the banks funds are helping concentration of economic power, it only means that either the Reserve Bank is not exercising a proper vigil, or there are loopholes in the actual working of the Act.

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New Vistas of ECONOMIC CO-OPERATION WITH CEYLON

M. K. DHARMA RAJA

Prime Minister Mrs. Indira Gandhi visited Ceylon in the last week of September. This article attempts to bring out the significance of this visit in terms of economic benefit to the two countries.

Scope for Joint
Enterprises •

Common Action
at Trade
Conference •

THE impact of Mrs. Indira Gandhi's recent visit to Ceylon is reflected in the forecast that is being made on both sides of closer economic ties and enlarged co-operation. After the goodwill aspect of the visit had been highlighted by the welcome for the Prime Minister, she and members of her delegation got down to wide-ranging talks with the Ceylonese representatives. These talks were dominated by problems of development. The joint communique issued at the end of Mrs. Gandhi's visit sums up the concrete decisions agreed upon by the two countries. By far the most important is the emphasis on bilateral relations with particular reference to trade and economic co-operation. Co-operation will continue all along the line and senior officials of the two countries are to meet once a year to review the progress in expanding it.

The fact that the discussions had contributed to a better understanding of the problems facing our two developing nations was underlined by Mr. Dudley Senanayake when I called on him a day after the Indian Prime Minister had left the island. He spoke of our heavy dependence on export trade in primary products and the continuing fall in their prices. This is bound to have serious repercussions on our economies and dislocate development activities. "We have agreed that our two countries should work together closely and in co-operation with others in like predicament to remedy the situation—to free us of dependence on the vagaries of the world market." He was happy

that there was to be concerted action. "We have decided", he pointed out, "to try and formulate a common line of action which we could present at the United Nations Conference on Trade and Development", scheduled to take place in New Delhi next February. There is to be an early meeting of the two countries, at the level of Ministers, to evolve a common approach to the subjects that will come up at the Conference.

Liberal Approach

Mrs. Gandhi had set the tone for such co-operation in the two major speeches she made in Colombo and Kandy, setting forth India's desire to fall in line with other developing nations. India and Ceylon can work together to reverse those trends in world trade which lessen the earning capacity of our exports while increasing the cost of imports. And so, it is necessary to join other nations similarly situated in pressing for a more liberal approach whereby developing nations can enjoy a fair and growing share in international commerce. It was, therefore, agreed that the delegation from Ceylon which is coming to New Delhi shortly will discuss the trend in world commodity prices in greater detail and exchange ideas on the problems of developing countries.

A call has now been given for Indo-Ceylon economic co-operation in greater depth and dimension. A concrete corollary is the impending visit to New Delhi of Ceylon's Minister for Trade and Commerce, Dr. M.V.P. Peiris. The stage had

earlier been set by the Industries and Tea Delegations which recently came to India. There will henceforth be an exchange of delegations at various levels including that of agricultural experts. Ceylon, for instance, will send a team to discuss better utilisation of seeds. Like India, Ceylon has been developing improved strains of paddy. The experts will exchange and pool the know-how on irrigation techniques.

At no time, indeed, has the need for economic co-operation between India and Ceylon been greater than now. Ceylon's plantation economy is passing through a particularly difficult phase because of a precipitous fall in the prices of its main exports, tea and rubber. The aid she has been receiving from the World Bank Consortium has been almost wholly offset by the slump in export prices. This has caused a foreign exchange problem for Ceylon.

In our own particular economic context, it will be to our benefit to exploit the Ceylonese market for our machine-tools and engineering goods. Ceylon is now importing them from the West. A way has been shown by Indian exports for the first time of high-speed and furnace oil. It would be worthwhile to forge economic ties through co-operative endeavours which help both countries. From this viewpoint, we need to examine joint enterprises with capital goods, from one country and raw materials from the other. The finished goods can meet demands within the two countries and even outside.

Material Investment

Ceylon's Prime Minister tirelessly put forward the idea of the complementary nature of our economies. In his conversation with Indian correspondents, Mr. Senanayake explained that Ceylon can, with its abundance of rubber resources, undertake the manufacture of tyres and tubes at lesser cost. She can supply them to India which, in turn, can produce motor cars at economic cost. Ceylon, similarly, can set up small industrial units while India can manage to go ahead with large-scale industries. Industrial production in the two countries can thus be complementary to each other.

This will open up larger employment opportunities in both and at the same time help remove a major incentive for illicit immigration.

India's participation in the Island's economic development can prove mutually advantageous, and in the long run be a fruitful material investment in friendship. Efforts can and should be made at official level to set up industries by the people of Indian origin settled in Ceylon. It has been pointed out that part of the blocked capital owned by Indian traders in Ceylon can be diverted to new joint ventures. The result will be a diversification of economy and a new pattern in economic co-operation. This point, though not disclosed in the joint communique, seems to have been agreed to in principle. Success in such ventures will go a long way in rectifying Ceylon's heavy adverse trade balance. This pattern of economic co-operation will, above all, redeem Ceylon from the need to continue depending on a few Western countries.

In this context is to be seen the attractive possibility of India and Ceylon getting together to strengthen their position in important primary products, like rubber and tea. China has been maintaining silence on whether she will renew her "rice-for-rubber" deal with Ceylon. Peking is yet to reply to Colombo's reminder that a Ceylon delegation is ready to go to China to reopen negotiations. India, it is known, has expressed interest in buying Ceylon's rubber. On this, Mr. Senanayake hastened to point out that even after meeting the commitment to China, Ceylon has enough resources of crepe-rubber to meet demands from other quarters. There should be no difficulty in India striking a deal for Ceylon's rubber in return for a wide range of engineering goods.

Tea Prices

There has been satisfaction in Ceylon that India has agreed to joint action to protect tea prices. An official delegation from India will soon go to Ceylon to continue the talks begun in Delhi last month. Meanwhile, agreement has been reached, among other things, on joint advertisement and sales pro-

motion campaigns. The vital need for the two bulk producers of tea to devise local facilities for blending and packaging has been recognised in order to save the producer from the Western middleman, who has for long benefited from an entrenched monopoly. India and Ceylon have decided to stand together with a view to restoring price stability in international markets.

New ground was broken by the two Prime Ministers in their plea for peaceful co-operation in the Indian Ocean area and economic collaboration among South and Southeast Asian nations. This has little to do with any political orientation or military over-tones of regional grouping. Mr. Senanayake evinced interest in India's idea of regional co-operation and a sub-regional set-up. He said he was going to Malaysia and Singapore this month for an on-the-spot study and discussions with the leaders of those countries.

Repatriation of Indians

The outstanding achievement of the Prime Minister's visit is undoubtedly the accord reached on the programme of implementation of the 1964 Indo-Ceylon Citizenship Agreement. Now that this issue is out of the way, we have reached a high water-mark of harmony, said Mr. Senanayake. Coinciding with Mrs. Gandhi's arrival on the Island, India had initiated action on repatriating the people of Indian origin qualifying for Indian citizenship. In the wake of the Prime Minister's visit, the Rehabilitation Secretary was in Ceylon for an assessment of the problem of resettlement. The main question for Ceylon is that of finding enough foreign exchange to clear the assets of those who are to be repatriated to India. Leaders of the two countries have turned down suggestions of third party aid. The idea of utilising the large assets of the people of Indian origin by way of loan is regarded as a practical solution. The concept of joint industrial enterprises, viewed in this context, is bound to prove beneficial to both.

PROTEINS FOR BETTER BRAINS

Young children need proteins to develop their brains.

Indian diet is deficient in proteins. A prospect of intellectual dwarfing, therefore, looms large before the country.

Research is being conducted for developing protein-rich grains.

Sharbati Sonora, a variety of wheat evolved by the Indian Agricultural Research Institute, is claimed to have 16 per cent protein in it compared to 7-8 per cent in the common wheat varieties.

pulses during the same period.

Protein needs will have to be assessed both in terms of quantity and quality. Among the components of protein, about 18 amino acids are necessary for normal growth. Deficiencies of some of them like lysine and methionine are common in a vegetarian diet, while the excess of the amino acid, leucine, in *Jowar* has been found by the Nutrition Research Laboratory at Hyderabad to be the cause of the disease pellagra in Andhra Pradesh and other areas where *Jowar* is the staple. The content of lysine and methionine per 100 grammes of protein in cereals, pulses and milk is given below :

	Lysine	Methionine
Cereals	1-3	1.5-2.5
Pulses	6-8	1.0-1.5
Milk	7-8	2.0-3.0

The figures indicate grammes per 100 grammes of protein.

Thus animal products like milk have proteins of better quality. While the increased consumption of animal products is therefore desirable, their production is a more expensive process owing to the considerable loss of energy in the conversion of plant products into animal food, as shown below :

Percentage of Food	Conversion Energy	Efficiency Protein
Milk	40	47
Eggs	20	43
Lamb meat	17	13
Pork	27	19

In the immediate future there may be little scope for diverting large quantities of calories to feed animals in order to get proteins of better quality, and hence overcoming protein malnutrition through increased consumption of animal products may not be immediately feasible. In fact, even now the proportion of males to females in cattle appears to be 2:1 in several parts of the country, an index of the uneconomic nature of cow-rearing. It should, however, be possible to ensure a larger flow of protein food to the feeding of infants and school children through both the mobilisation of public opinion and Government action. The shortage of calories affects the utilisation of proteins. If the scientific revolution in the yield potential of cereals and millets is taken to its logical conclusion, the problem of calories can be solved and adults, even vegetarians, can be assured of a satisfactory diet.

METHODS

President Johnson's Science Advisory Committee, whose thought-provoking report on "The World Food Problem" has recently been published, has suggested the following steps for increasing and improving protein supplies :

1. Develop high protein foods, especially for pre-school children, from indigenous products.

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2. Increase the production and use of pulses and oilseeds such as soyabeans, groundnut, and cottonseed.
3. Increase and improve domestic animal production, especially types that do not compete for the food used by human beings.
4. Utilise pond culture of fish, both by itself and in combination with agricultural practices such as rice culture and irrigation projects.
5. Increase catch of sea foods.
6. Expand and intensify research and development related to fish protein concentrate.
7. Develop and utilise new genetic strains of plants that provide protein with a higher nutritional value.

The Committee has also recommended more research on protein from leaves, single-cell micro-organisms grown on substrate such as petroleum and algae. Such research has recently been initiated on a global scale under the International Biological Programme. Intensive research is also needed on the wholesomeness of cereal grains enriched with lysine or other essential amino acids.

While all these ideas are important and worthy of vigorous follow-up, we in India have to face this problem *today*, since delay in wiping out the protein hunger in the young could lead to the intellectual dwarfing of over 10 million children every year. Much damage must have already occurred in the past years.

INDIGENOUS RESEARCH

A major breakthrough in the genetic manipulation of protein quality took place in 1964 when Dr. E. T. Mertz, L. S. Bates and O.E. Nelson of Purdue University in the United States, discovered that a maize variety with opaque seeds had nearly twice the content of lysine as normal maize. When rats were fed with a diet containing 90 per cent opaque maize for 28 days, the average daily gain in weight was 97 grammes in contrast to 27 grammes in those fed in a similar way with normal maize. Pigs grew very well on a diet composed of opaque maize, minerals and vitamins without any supplementary protein.

These findings showed that the genetic enrichment of cereal proteins with lysine and pulse proteins with methionine as well as the lowering of the leucine content of *Jowar* are all possible. The artificial enrichment of cereal grains with essential amino acids, whose effects are not yet understood in their totality, can thus be avoided. A world collection of wheat and *Jowar* varieties is currently being screened at the Indian Agricultural Research Institute for amino acid composition and interesting results have already been obtained.

Protein quantity varies widely in wheat—from 7 to 8 per cent in some of the varieties commonly cultivated to over 16 per cent in recently developed strains such as Sharbati Sonora. The application of nitrogenous fertilisers increases protein content by about 50 per cent. Varieties like Lerma Rojo, Sonora 64, Sharbati Sonora and N. P. 852 have yielded protein content as high as 18.5 per cent when cultivated in fields fertilised with 80 to 120 kilogrammes of nitrogen per hectare. Similar variations in protein content have also been found in rice, barley, *bajra*, maize and *jowar*.

Thus there is enormous scope for increasing the intake of proteins per unit weight of cereals and millets both through the cultivation of high-protein varieties and through the application of fertilisers. The introduction of a protein premium in the pricing policy would help to generate protein consciousness among farmers and consumers and at the same time help increase the protein content of the average Indian diet.

Protein assay in samples in grain markets is operationally feasible. A farmer who applies fertiliser invariably raises the protein content in the grain. Sometimes, such grains may develop a little mottling and present market classification of wheat varieties would penalise rather than reward farmers who have produced grains with a high protein content. The fixation of wheat price according to protein content will, therefore, promote an awareness of the importance of both human and plant nutrition. Quantity and quality can both be combined genetically

and the release and spread of high-yielding and high-quality varieties of cereals, millets and pulses would offer the least expensive and immediately practicable way to eliminating the threat of intellectual dwarfism.

A PROSPEROUS VILLAGE

THE Planning Forum of the Scott Christian College, Nagercoil, undertook a socio-economic survey of the adjoining village Santhapuram. Sixty per cent of the people are agriculturists in this prosperous village. There are two high schools—one for boys and the other for girls—upgraded during the Third Plan.

Of the total population of 1,786, 55.5 per cent are male. The average size of the family is 5.7 persons. Among the men, 51.3 per cent and 62.5 per cent of women are married. The percentage of literacy is 60.5, with 95 matriculates, 13 graduates, and one studying for the post-graduate course in Madras. They read Tamil and English newspapers.

Ownership cultivation is the main feature. A small portion of wet lands belongs to the people of Nagercoil town. Paddy is the main crop with the average per acre yield of 1,320 Kg. Chemical manures are not used. Cowdung is the only manure used. Coconuts, mangoes, cashewnuts and jack fruit are also cultivated. Milch cows are few.

There are 57 persons unemployed and 85 underemployed. Most of the people own houses. Out of 103 such houses, three are bungalows, 30 huts and 70 small houses. Twenty per cent of the houses are electrified.

The per capita income of the villager is Rs. 122.02 a month and expenditure Rs. 122.3. Only 27 people could save.

The Hindustan Aeronautics Limited earned Rs. 20 lakh in foreign exchange in 1966 by supplying aero-engines and other components to the Rolls Royce of Britain.

THIS INDIA

YOJANA invites contributions to this feature from its readers all over the country. Each anecdote must be true to life, of less than two hundred words, capturing something significant of India's rich and varied life. Each published anecdote will be paid for.

I know a lecturer in Agarwal Inter College, Agra, who had applied to the Agra University for permission to appear in the M.A. (Previous) Examination, to be held from March 30, 1967. The permission came only on March 31; so he could not take the First Paper on March 30. As he missed the first paper, he thought it useless to appear for the remaining papers.

But when the result of the M.A. (Previous) Examination was published, he was astonished to find his roll number in the list of successful candidates. In the last week of July, he received his marks sheet according to which he had secured good marks in all the four papers. In fact he had appeared for none.

Agra *Tilak Raj Sikka*

In a small town near Ahmedabad, a new school building was under construction. The contractor was also a mason. He was illiterate and belonged to the same town.

One day, some persons who worked with him complained to him that they would not get enough profit from this contract. So they advised him to reduce the proportion of cement and increase that of sand in the mixture, so that they can save on cement.

The mason thought for a while and said, "If we use less cement and more sand, nobody will detect it and we can earn more profit. But the building will crack soon."

He smiled and continued, "You and I were not fortunate enough to ever go to school. There was no school in this village when we were boys. So we should be proud of having this school for our children. But what will the children learn in this school where every wall will speak of their parents' dishonesty?"

Bilimora *Dhirubhai N. Shah*

To be a successful farmer is not always a blessing. An Assamese farmer used to grow sugarcane on a moderate scale. Later he took pains and adopted improved methods and soon attained the distinction of being one of the most successful sugarcane growers of the State.

The luxuriant growth of the plants in his farm attracted a stream of visitors, mostly Government officials, from the different parts of the State. The farmer regarded this as a rare honour done to him and entertained the visitors to tea and whatever else he could afford. But, unfortunately for him, the visits of officials became a never-ending affair and soon he found his meagre means were too short for his hospitality. Nor could he bear the idea of becoming inhospitable to his honourable guests who never ceased to call upon him. Finding no other way to save his honour, he hacked the sugarcane plants to pieces.

Jorhat *Chandra Kanta Bora*

My friend Bhaskaran was a stranger to the town. Once, returning from shopping, he found himself in a fix. Dusk had fallen, and the street lamps had been lighted. But Bhaskaran's hired bicycle had no light. He was pedalling at break-neck speed with packets tucked under his arms when suddenly he heard the shout: "Stop".

A police constable was approaching him. Bhaskaran jumped off his bicycle.

"You've violated the traffic rules. You are moving against the one-way traffic, and your bicycle has no light, either", the constable admonished him. "Your name and address?"

"P.T. Bhaskaran, C/o District Collector....."

The constable eyed him curiously. "How are you related to him?"

"Don't you know me? I am his nephew." Bhaskaran did not bat an eyelid.

Now the constable turned apologetic. "Excuse me for the mistake, sir" he said, and disappeared.

Ernakulam *Muhammad Edachal*

I went to a village in Alleppy district of Kerala to conduct a film show. A prominent man of the locality whom I had known earlier came to me after the 'show' and invited me to his house.

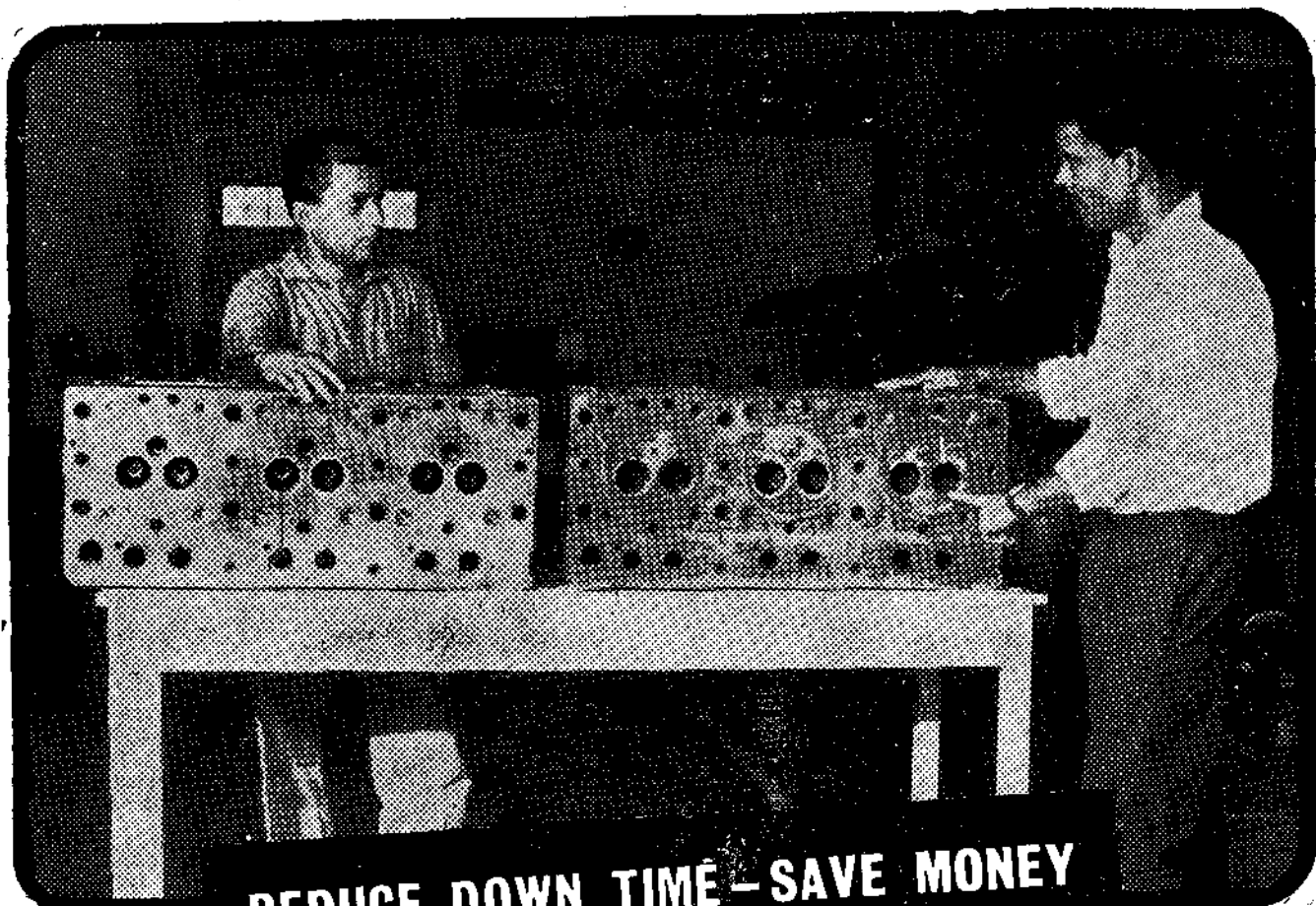
When I reached his house, I was rather astonished to see certain religious rites being performed to propitiate Nagaraja (snake god). I asked my host what it meant.

"Oh! We are worshipping the snake god," he said casually.

"But sir, I know you are a staunch protagonist of Marxism and Marxists are atheists," I argued.

He gave a faint smile and said in a low voice, "My political interests have nothing to do with my family life."

Alleppey *S. Sreedharan Nair*



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IMPLICATIONS OF ABOLISHING LAND REVENUE

Amidst the general demand for land revenue abolition, the author of this article argues the case against doing away with this "simple" and "economic" tax. He feels that new levies in the rural sector to compensate the loss of revenue will introduce further complications and any move to tax the non-rural sector will widen the burden disparity between the two sectors. Land revenue abolition may also lead to a demand for a scrapping of a few levies in the non-rural sector.

D.N. DWIVEDI

MOBILISATION of domestic resources for production investments has become the central theme of modern fiscal planning of the underdeveloped countries. There is an all-round search for more effective methods of extracting a substantial portion of the increased income generated by the development programmes in the various sectors of the economy.

In India, however, a contrary trend has manifested itself in recent days. State Governments are now committing themselves to abolishing land revenue which has been one of the most important sources of their income, besides being the oldest and the most popular agricultural tax not only in India but in other countries too, because of its simplicity, low cost of collection and low tax burden on farmers. Even during the days of Manu, land revenue was the most popular tax. He himself had recommended one-sixth to one-fourth of agricultural produce as the share of the state. In modern times continuous efforts are being made in almost all parts of the underdeveloped world to devise ways and means

to tap the resources from the rural sector which, it is widely held, is undertaxed. The idea is to make tax burden equitably distributed. In India also a case has been made for additional taxation of the rural sector and rationalisation of agricultural taxes.

Considering all this, one is led to suspect that the slogan of abolishing land revenue may have a political motive rather than economic. The only economic justification which has been put forth so far is that it gives some relief to the poverty-ridden farmers. But nobody appears to be aware of the proportion of this relief to the total requirements of the poor farmers.

The problem started with the pledge of political parties during the pre-election period that they would do away with land revenue in the event of their coming into power. Congress and non-Congress governments were thus faced with a prior commitment.

Let us examine the implications of this commitment. In Mysore, abolition of land revenue would involve an annual loss of Rs. 5.79 crore according to the 1966-67 budget. Measures proposed in

other States would involve loss in revenue in varying degree; Har- yana Rs. 0.18 crore, Madhya Pradesh Rs. 1.50 crore, Madras Rs. 1.32 crore, Punjab Rs. 0.54 crore and Uttar Pradesh Rs. 6.5 crore.

Together with similar measures in some other States, land revenue abolition may mean a substantial loss in revenue. This adverse impact on resources and the consequent widening of burden disparities between rural and non-rural sectors are important aspects of the move to abolish revenue. Besides these there are other related economic and political implications.

The States abolishing land revenue cannot make up the loss in their resources without introducing further complications in their tax structure and some of them may be undesirable from a social point of view. For instance, Bihar, where abolition of land revenue on all categories of land holding involves a loss of Rs. 12.67 crore, is examining the possibility of substituting land revenue by some other taxes. Some of the possible taxes which may be imposed on the agricultural sector are agricultural income tax, surcharge on or enhancement of irrigation rates and cess on commercial crops. Bihar has already imposed agricultural income tax. Total collection in the year 1965-66 (revised estimates) amounted to Rs. 33 lakh only whereas the budget estimate for 1966-67 stands at Rs. 31 lakh which is only 2.5 per cent of the total loss. A surcharge on irrigation rates or their enhancement may result in underutilisation of irrigation potential. Similarly cess on commercial crops will affect adversely the acreage under those crops. Mysore is likely to make up a part of the total loss of Rs. 5.79 crore by relaxing the Prohibition Laws which may encourage the anti-social elements and may also lead to administrative expenditures.

Mr Dwivedi is a Research Scholar in Economics in the Banaras Hindu University.

The intensity of the problem in the case of States abolishing land revenue only on small holdings is less. But they, too, will find it difficult to make up the loss because imposition of other taxes on the agricultural sector may not be popular, and imposition of taxes in the non-agricultural sector may widen the gap between tax burdens on the two sectors, which is not justified. In Uttar Pradesh there is a proposal to enhance the rates of agricultural income tax so as to cover the loss. But in this State, the yield from agricultural income tax and the number of assesses have been continuously declining except the early years of its imposition. The Tax Law for large holdings in this State is such that the size of holdings can easily be curtailed to avoid the tax.

Collection Cost

According to the Taxation Enquiry Commission (1953-1954) the incidence of taxes on the rural population is less than half of what it is on the urban population. Under these circumstances, abolition of taxes on the rural sector will not only make the imposition of further taxes on the non-agricultural sector difficult, but may create a demand for abolition of similar taxes in the latter. Such a demand cannot be said to be unjustified. Uttar Pradesh has already abolished the tax on urban land and building involving a loss of Rs. 2 crore annually. There may, thus, be a series of steps abolishing various taxes, and State resources may be reduced to the minimum.

Would abolition of land revenue at least lead to a saving in collection costs? There is a long chain of staff including Tahsildars, Kanoongos, and Lekhpals in the land revenue department. Abolition of land revenue cannot be accompanied by the termination of the services of these employees or their transfer to other departments because this would involve other complications. Even if employees are transferred to other departments the total expenditure remains unaffected. This problem becomes much more complicated in case of abolition of land revenue only on small holdings because in that case the employees of land

revenue department will have to be returned. Thus the per unit cost of collecting land revenue may be very high and retention of land revenue on bigger land holdings may prove to be uneconomic.

Small farmers, in order to meet their monetary obligations save a part of their total produce and dispose of it in the market. Thus the marketed surplus of the small land owners depends mainly on their monetary obligations such as payment of taxes, interest and repayment of debts and purchase of seeds, fertilisers, agricultural implements and other manufactured commodities. Apparently, land revenue, since it is paid in terms of cash, is a sort of monetary obligation. Therefore, abolition of land revenue will curtail the volume of marketable surplus to some extent, and hence may support the inflationary situation in the country. If all States abolish land revenue only on the small holdings the total annual loss in revenue may be Rs. 20 crore. It may be expected that the marketable surplus to this extent will be either consumed by the farmers or spent on the purchase of other commodities. In case it is consumed, it may aggravate the inflationary situation in the country.

Cropping Pattern

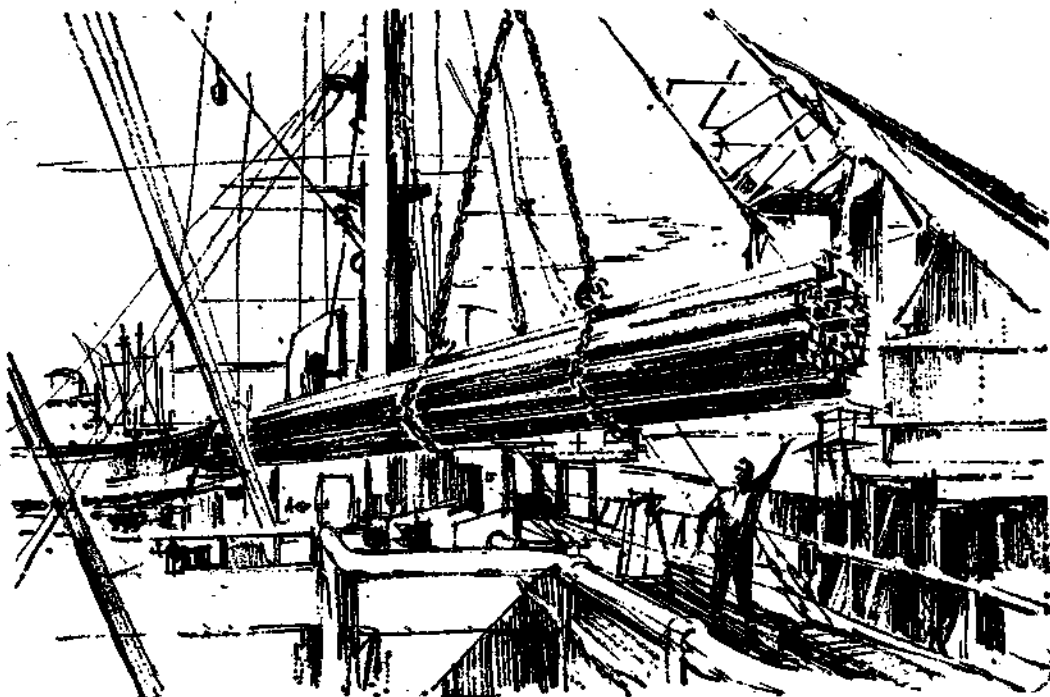
Abolition of land revenue may affect cropping pattern also. Farmers generally allocate a part of their holding for growing cash crops so that they may dispose of it easily and meet their monetary obligations. How far the abolition of land revenue will affect the production of agricultural raw materials and help the inflationary trends deserves to be considered.

Abolition of land revenue, even on small holdings only, may affect agricultural growth adversely. It may be argued that abolition of land revenue may leave certain investible funds at the disposal of agriculturists who may invest them for increasing their production. But the probability of such a development is insignificant because any fund at the disposal of underfed agriculturists would be spent on consumption. Further, revenue relief given to farmers is

so insignificant compared to their capital requirements that they can hardly make any capital investment. For example in Uttar Pradesh, land revenue is a little less than Rs. 5 per acre. Thus on a holding of 6.25 acres, the revenue relief would be not much more than Rs. 30 a year, an amount which can neither buy a bullock nor dig a well. But the same insignificant amount pooled in the treasury will form a big investible fund which may be utilised for constructing tube wells, land reclamation, for providing long- and short-term credit to the farmers for digging wells, purchasing bullocks, agricultural implements and fertilisers and for subsidising the production of preferential crops, which may prove highly conducive to agricultural growth. For lack of funds, in many States such schemes are held up. For instance, in Rajasthan six medium irrigation projects approved by the Planning Commission are held up. Andhra Pradesh has been forced to reduce its Plan outlay for 1967-68.

Politically, the States that have not yet abolished land revenue or are not willing to abolish it on economic grounds may find it very difficult to retain land revenue. It may become a major source of conflict among the members of the ruling party or among the parties in a coalition government. Internal and external pressures may force these States ultimately to adopt what is politically rewarding. And when the implications of abolition of land revenue are realised, the States may find themselves unable to revive the revenue. The task of reimposition would not be as easy as abolition. In future, it might be immensely difficult for the States to reimpose land revenue due to the same political factors which caused its abolition.

Lastly, this may also affect financial relations between the Centre and the State Governments. If State Governments go on cutting their resources, the Centre would not like to gain unpopularity by imposing further taxes in order to meet the financial requirements of the States. The Central Government, on the other hand, may think of penalising such States by cutting Central grants to them.



Tata Steel goes abroad

Several times a year, ships carrying, among other things, angles and channels, bars and joists, and other steel products made in Jamshedpur, sail away from the Calcutta port...bound for East Africa, the Middle East, the Far East and Australia. These steel products are of utmost importance to the importing countries for their economic development.

Exports by Tata Steel, which are channelled through Commercial and Industrial Exports Limited (CIEL), the Government-recognised export house of the Tata

Group, spurred to over 43,000 tonnes valued at Rs. 2.25 crores during 1966-67, from about 26,500 tonnes valued at Rs. 95 lakhs in the previous year. The increasing exports indicate Tata Steel's concern to do its bit to augment the country's foreign exchange earnings, so vital to the success of our national goal of planned industrialization.

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TECHNOLOGICAL WILDERNESS

MR. Jahangir Ghandy, Chairman of the Eastern Regional Committee of the All India Council of Technical Education, referred only to an aspect of the problem when he spoke of the vast addition to the roll of the technical unemployed caused by the "recession".

But even without the recession, the technologists were not finding things easy. Opportunities do not open up as fast as they can be filled. Otherwise, it is difficult to explain why so many of our young men with technical qualifications readily accept modest administrative positions.

In the three Plans, we had fulfilled ambitious targets of technical education. In the Third Plan alone, some 93,000 engineering graduates were added to the national roll; the figures for diploma holders and craftsmen far exceeded one lakh in each category. And in the Draft Outline of the Fourth Plan, a target of doubling this achievement was proposed, besides turning out over a lakh apprentices, four times as many as we turned out in the Third Plan.

The question naturally arises if all this has any relevance to the reality. What use is it to fill the country with so many technically qualified young men when we are not able to find them worthwhile work to do? This is not just a problem posed by the recession. This is a larger and continuing question that will remain long after the recession had vanished, unless we do something about it.

There is at least the danger that the sight of the technically unemployed may drive away promising young men from technical studies. There is some evidence that this is already happening. In Kerala this year, the Director of Technical Education was hard put to fill the five engineering colleges in the State. Thrice did he advertise and thrice was he rebuffed; so much so he had to bring down the qualifying limit to 45 per cent marks; and even at that applicants were hard to get. What a far cry from the

days when first class intermediates were turned away from the limited room in Engineering classes in the country!

Apart from finding enough jobs, there is the question of how well we treat technical personnel. The struggle between administrative and technical personnel has raged for far too long for the country's health. Not merely in pay scales and status but in decision-making technical men are increasingly demanding an assured right. And it is rash to reject their demand as unjustified. It was to this problem that Dr Vikram Sarabhai referred when he spoke to *Yojana* (October 1, 1967) about the complementary roles of the preservers and the innovators.

Hats Off

ENGLISHMEN, it seems, are fed up with their hats. The bowler hat, a national symbol as much of authority as of eccentricity, is simply being thrown away. Is it that there are not enough men qualifying to be mad as a hatter? Or is it that under the Queen men are not what they were? The curator of London's Victoria and Albert Museum, Mr. James Lever, must give the answer. Did he not hold that "the degree of male domination can be judged at any time from the height of a man's hat"?

As much can possibly said of India, too. With Nehru and Lal Bahadur gone, the cap is less in evidence and where one is found, as on the austere Professor Gadgil, men are somewhat comforted by the thought that all is not yet lost—a point which Mrs. Gandhi might take into account if she means business.

She will not find things as easy as Elizabeth finds in England—or does even Elizabeth find it so with the growing number of Sikhs in her country? In India, the Maharajas and the Yuvarajas safely thrust their heads into the turbans when a strict Saville Row three piece suit does not bring home the bacon.



IGNORAMAN Wants to Know

*If Formosa belongs
to China or
China to Formosa*

Gandhi very much liked Nehru's apt description of the khadi cap as the livery of freedom. So in our times is the turban the passport to an election victory. For, with all this so much rubbish now being talked about, Indian democracy is still able to do with a lot of the mother image of the Maharani and the turban image of the Maharaja; though, Air India has shamelessly commercialised a great institution.

Mr. Yeshwantrao Chavan will find his burden greatly lightened if he poses before the privy purse baiters the crux of the problem: "Where will the princes have the money to balance a turban on their heads?" Therefore, with the privy purse problem so easily solved, Mr. Chavan can certainly restore men in this country to their deserved pre-eminence. Once this is done, Mrs. Gandhi wouldn't know where to look. For even within her Cabinet, she will find many turbans suddenly popping up, apart from the khadi caps on her senior colleagues.

Which is why Mrs. Gandhi is not going to find things easy. And if she means business, she must regard the privy purse problem from this point of view. This is the sane, practical way of clinching the ideological debate.

Let her take a lesson from Kerala, which, as we all know, is a woman's world. There the men have always bared their heads and where are they?

EFFECTIVE LINKS IN RESEARCH

SCIENTIFIC research in our country has grown into a large national undertaking. There are about 205 research institutions (both Government and private) and 4,000 science departments in universities, employing an estimated 50,000 professional scientists.

From an organisational point of view, our entire scientific research can be classified into five categories: (1) Research under autonomous organisations such as the Council of Scientific and Industrial Research (C.S.I.R.), Atomic Energy Commission (A.E.C.), Indian Council of Agricultural Research (I.C.A.R.), Indian Council of Medical Research (I.C.M.R.), and the Defence Research and Development Organisation (D.R.D.O.), (2) Research under various Ministries of the Central Government, (3) Research under the State Governments, (4) Research in universities, (5) Research in industries and other private institutions.

For this organisational hierarchy, effective co-ordination is needed at various levels for prudent deployment of resources. Studies have already identified three distinct levels at which decision-making is crucial: national level, level of a parent agency or organisation controlling a number of laboratories or institutes, and the laboratory or the institute level.

At the national level some degree of co-ordination is supposed to be brought about by the Scientific Advisory Committee to the Cabinet (S.A.C.C.), the Planning Commission and the various Ministries of the Government to which research organisations are constitutionally affiliated. At the next lower level, the co-ordinating agencies are the scientific advisory

AQUEIL AHMED

Research Survey & Planning
Organisation, C.S.I.R.

There is no proper co-ordination between scientific research at the national level and that at the state level or in the industries. A correct understanding of the entire organisational process in science is vital to gearing scientific research to common goals.

This brief paper aims at focussing attention on the problem of co-ordination of scientific research at various organisational levels.

boards, governing bodies and offices of the Director Generals of large autonomous organisations. Co-ordination at the laboratory or institute level is the responsibility of the local administration headed by a Director, who may appoint an executive or advisory committee for consultation and advice on plans and programmes for his institute.

Inter-related Objectives

Like the human brain, the co-ordinating agency in a complex social system is supposed to perform certain vital functions in order to keep the system going in an orderly fashion. The first step in this direction is to evolve a co-ordinated plan of objectives and actions in such a way that they are inter-related and do not negate each other. In other words, achieving one of the objectives, or acting in a particular way, would not negate other objectives and actions; rather

they would bring the organisation a step closer to the ultimate goal. To keep the system going as planned, the co-ordinating agency should also be able to exercise some degree of control over system processes and evaluate their performance so that immediate and future corrective actions may be taken if necessary. The planning function cannot be performed well unless the co-ordinating agency has sufficient information at its disposal regarding the needs of the clients and the needs and potentialities of the system (for example, money and manpower available and required) for survival, growth and prolificacy. Similarly, neither evaluation nor corrective measures are possible without having necessary information about system processes and the means to alter or influence them. Information collection, its storage and retrieval are, therefore, essential prerequisites for effective co-ordination.

A co-ordinating agency only takes decisions and does not itself implement them. Implementation rests with the units or parts whose activities are to be co-ordinated and over which the co-ordinating agency has some degree of influence essential for compliance. The multi-layered organisational structure of science in India is a decentralised system. A number of decision-making units operate at various levels co-ordinating the activities of a still larger number of functional units.

Constitutionally, each co-ordinating agency consists of scientists and public servants who are supposed to be well-informed about national requirements and the needs of the organisations whose activities they co-ordinate. These agencies are vested with powers to formulate

major policies, plans and programmes (or advise on such matters), supervise operations, and evaluate performance with a view to achieving certain desired objectives. But since the organisational process has never been subject to scientific analysis, no rational claims can be made about the efficiency of the co-ordinating system.

National Level

At the national level, the S.A.C.C. is primarily an advisory body and does not normally perform any of the co-ordinating functions, namely, formulation of policies and plans, control and evaluation. The autonomous organisations, like the C.S.I.R. and I.C.M.R. may sometimes refer policy matters to the S.A.C.C. and seek its mandate. The S.A.C.C. does not have any links with the research under State Governments and the links are only negligible with industrial research.

The Planning Commission co-ordinates research by allocating money for scientific research in the Five Year Plan periods, according to national commitments and priorities, and by cutting down the proposed yearly budgets of the research organisations to keep expenditure within the authorised limits. The Planning Commission does maintain a Scientific Research Division which is supposed to provide information about national requirements of, and for, scientific research. This information, however, does not cover all aspects of research and is mostly based on estimates arrived at by research organisations themselves. How far the Planning Commission's decisions about financial allocations are based on whatever information it has, is anybody's guess.

The affiliation of autonomous research organisations to Central Ministries is only constitutional. In practice, the Ministries do not perform any co-ordinating functions; they are left to the autonomous organisations themselves. The Ministries do, however, actively look after research departments directly under their control, although the mode of co-ordination is rather obscure and may differ from Ministry to Ministry. There is no particular agency for co-

ordinating inter-Ministerial research and the links with research under the States and in industries and universities are only negligible.

Among themselves, the S.A.C.C., the Planning Commission and the Central Ministries do not have any regular, active links which may help provide a basis for understanding general research efforts and avoiding wasteful duplication.

At the next lower level, the boards and governing bodies of autonomous research organisations are active co-ordinating agencies for the work these organisations do. The boards have, however, become mostly advisory in nature; the governing bodies alone are responsible for formulating plans and controlling and evaluating performance through resolutions which are implemented by the Director Generals and their secretariats. For evaluation purposes, special reviewing committees may be appointed by the governing bodies from time to time. But some of the autonomous organisations, such as the C.S.I.R., are so large and varied that co-ordination becomes difficult. As an aid to its operations, the C.S.I.R., therefore, maintains four centrally-located technical Directorates to keep track of national requirements, investigate ways to bridge the gap between science and its users, assess the needs of research laboratories, study the scientific potential in the country and carry out researches on a wide variety of problems that have to be met for the growth of science and its application in national development. Unfortunately there is no precedent for use of this information by the decision-making bodies for research co-ordination. Other autonomous organisations have not even established such services. In the absence of direct representation from research laboratories, governing bodies have to depend upon the advice of the Director Generals who may at times be partisan or misinformed.

Universities

The University Grants Commission, which is the most important decision-making body for matters concerning universities, does not have any agency for collecting necessary information about scientific research in universities nor for

co-ordinating inter-university researches. The Atomic Energy Commission is, on the other hand, structurally a homogeneous organisation and may, therefore, co-ordinate its activities efficiently.

Among themselves, the autonomous organisations do not have any structural links, except an occasional overlapping in the membership of advisory boards and governing bodies.

Laboratories and Institutes

At the laboratory or institute level, where the structure is less complicated and vital information on internal and external needs is readily available, co-ordination is more easily achievable depending upon the ability of the Directors and their administrative staff. Thorough investigations are, however, required to find ways and means through which the Director can most efficiently manage his outfit.

As mentioned earlier, the research under State Governments and in industries has very weak links with that under the Central Governments and is, therefore, not properly co-ordinated with the overall national research effort. Also, there does not seem to be any significant co-ordination in research between different States or different industries.

The above analysis suggests a strong need for vital information on national requirements in industry, agriculture and medicine, which can be met through scientific research; information on the availability of scientific potential in the country; information about the needs of research organisations for their growth and effectiveness in national development; analysis of structural arrangements conducive to efficiency; and the understanding of the entire organisational process in science itself. If such information and insight is available and intelligently used in planning, control and evaluation of research, links can be forged between research organisations and between the research and its users to help evolve programmes through which all the scientific research in the country could be geared to meet common goals and public aspirations.

Books

FOREST RESOURCES FOR PAPER INDUSTRY IN INDIA

A Study on Forest Raw Materials for Pulp, Paper and Newsprint—by the Committee on Natural Resources, Planning Commission, New Delhi. 66 pages.

P.D. Stracey

THE "Study on Forest Raw Materials for Pulp, Paper and Newsprint" produced by the Planning Commission's Committee on Natural Resources is a useful compilation which will serve the reference needs of a wide range of people from researchers to planners and entrepreneurs. In this connection, the summary and recommendations at the end of the report will probably be found most useful for ready reference.

After dealing with trends and prospects in the paper industry as a whole, the study naturally gravitates to the raw material position and thereafter to the demands for pulping materials, which are projected up to 1980-81. Half way through this section, the report rather abruptly jumps to the proposed programme of pulpwood plantations for the Fourth Plan designed to make good the deficit. Further, for what constitutes almost half the whole report, the discussion is confined to this question. The chapters on pulpwood plantation research and economics are more suitable for a technical discussion of that subject.

The study then switches to technical processes and recent developments in the paper industry. This section might well have been curtailed, for it consists largely of explanatory descriptions of the various existing processes of pulping, the only new item being a discussion of the methods of manufacture of paper from bagasse with particular

reference to India's requirements of newsprint.

As regards the main problem of raw material availability for extension of the paper industry, establishment of market pulp production units and, perhaps most important, newsprint manufacture (to meet India's requirements and do away with the present expenditure of foreign exchange on this commodity), one detects a failure to cover enough ground and to analyse the present situation properly. Take, for example, bamboo which is No. 1 raw material on which India's paper industry has been built up. While the report brings out the overwhelming superiority of Assam in the matter of bamboo availability, it is less than fair in allocating only one 300 t/d pulp mill to it if Madhya Pradesh, with only one-fourth of Assam's bamboo potential (as recorded in the report), has been allotted a mill of almost similar size. Scrutiny of the Assam position reveals that, if an attempt were made to group the zones by contiguity, and Manipur (which has its natural outlet into Cachar via the Barak river) and Tripura bamboos as well as the reeds of the central and upper Assam zone were taken into consideration, at least two more pulp mills could be obtained. The Assam area can also possibly contribute large quantities of reeds, grasses and bamboos from the jhum lands in the hill districts; after all, Nagaland is planning her paper mill almost entirely on such resources.

The point has been correctly emphasised that it will be necessary to mix bamboos and hardwoods (whether from existing forest resources or future plantations, mainly of eucalyptus) in the proportion of 30:70, but the study under review

does not appear to have included efforts to locate such large quantities of hardwoods, amounting to 42 lakh tonnes. Here again the Madhya Pradesh portion of Dandakaranya, together with the adjoining Orissa and Andhra Pradesh areas, and Assam are likely to be the main contributors; but Assam, with its large number of unutilised miscellaneous species in the mixed forests that are in close juxtaposition with the bamboo forests of the central zone, would be likely to tip the balance. An additional important feature of this central zone is the occurrence of the low level Khasi pine, one of the valuable long fibre conifers, in the Jaintia hills on the western side of the Kopili which, with its tributary, the Diyung, drains the central zone. This close association of hardwoods, bamboo and conifers is unique and should be exploited.

Where the study has failed is in its somewhat superficial treatment of the Himalayan conifer forests, almost the only (and a most valuable) source of long fibre pulpwood in the country. The amounts of fir and spruce wood available in the Himalayan States of J. and K., Himachal Pradesh and Uttar Pradesh can be roughly estimated at 5.48 lakh tonnes, nearly sufficient for four newsprint mills each of 200 tonnes a day capacity. (Incidentally, the figures given for Jammu and Kashmir do not tally with published statistics.) But that is not the whole story. At present, only about 50 per cent of these Himalayan forests are being exploited, the bulk of the utilisation falling on species other than fir and spruce. The fir and spruce, growing as they do at higher levels, await the development of the newsprint industry before they can be harnessed to meet India's pulpwood needs.

Tied to this problem is the question whether these two species

should continue to be used for sleepers when they are not really suitable on the one hand and when, on the other, they are ideally suitable for pulping. The parallel question of foregoing the high price per cubic foot of wood now being converted into sleepers (assuming the Railways agree to give up the species for this purpose) can only be met satisfactorily by a change in the transportation methods of wood in the Himalayas that will permit the establishment of the pulp industry which will absorb much greater quantities of wood.

When Canada has successfully experimented with the transport of wood chips through water by way of pipes, there is no reason why this method cannot be tried here. Application of this system to the Himalayan conifer forests as a whole will help to realise the enormous quantity of waste wood of all species being worked out at any one time in a particular drainage; at the present moment this amounts to as much as 40 per cent of the tree outturn when reckoned in hand-sawn sleepers. It is a pity that the committee which did the study could not give a lead in these matters beyond recommending that the "latest logging and transport methods should be introduced".

As it is, the conclusion that no real contribution to the pulpwood problem can be expected from the conifer forests of India until extraction improves to the point of being able to bring down the wood in the shape of logs, is at best a negative one; at the same time, it is difficult to reconcile it with the statement elsewhere in the report that "the shortfall (of cellulosic raw material) will have to be made good by tapping the hitherto unexploited coniferous forests in the Himalayas".

To conclude; one can say that the study, although a useful first attempt, is not the whole picture. More thorough probing is needed to establish the exploitation possibilities of the available raw materials on rational lines, rather than recommending heavy investments to produce future resources in the form of artificial plantations. The pulpwood possibilities of adjoining friendly countries like Nepal, Bhutan and Sikkim should also not be overlooked.

FINANCING OF FERTILISER PROJECTS

Seminar on Cost and Financing of Fertiliser Projects in India—1966. Proceedings. Published by the Fertiliser Association of India, New Delhi. 412 pages.

V.R. Damle

THE Fertiliser Association of India had organised a National Seminar on Fertilisers in December 1965. Encouraged by the good response it received, the Association organised another seminar on 'Cost and Financing of Fertiliser Projects in India' in 1966. The papers read and the discussion held at this seminar have been published in this book.

The book is divided into seven parts: (1) Inauguration, (2) Topics relating to the cost reduction in fertiliser production, (3) Discussion on setting plants based on imported ammonia, (4) Topics relating to cost reduction in fertiliser marketing and distribution, (5) Topics relating to financing of fertiliser projects, (6) General papers, and (7) Resume of the seminar and the recommendations.

While the papers include oft-repeated general statements of fact, they also include technical papers by technologists representing Indian fertiliser manufacturing units as well as foreign designers and concerns manufacturing fertiliser equipment and machinery. Topics like problems of financing fertiliser projects in India—both in the private and in the public sector, aspects of foreign assistance, capital resources for fertiliser plant construction, and AID extended risk guarantee, also find place in this book. There are reviews of the fertiliser industries of India and Japan, and a glimpse of world trends in fertilisers. The recommendations made by the seminar have been summarised at the end of the book.

A reader may not agree with an argument here or there in some of the papers. Some element of salesmanship may also be traceable in some papers. However, there is

sufficient material to ponder over for the chemical technologist, the entrepreneur, the manager and the Government bureaucrat, concerned with the fertiliser industry.

Almost all the aspects of the cost per unit that the farmer has to pay for the effective nutrient have been dealt with at one place or the other. Costs due to plant, including costs due to process, size of the plant, location, engineering, field work, speed/delay in implementation, off sites etc. have been discussed. In the discussion on cost of operation are included technical problems of generation of high pressures, heat recovery, improved catalysts, instrumentation and control. Emphasis has been placed on reduction of cost due to maintenance, and a system of inspections and preventive maintenance has been suggested. A close study of the units of operation and reduction by higher productivity has been highlighted in one of the papers. Standardisation of general equipment and spares that help in reducing cost has also been indicated.

Different facets of the question have been brought forward. Many of them are well known—after all "new techniques are often old ones in disguise".

The book is well printed. The price has not been indicated. The Fertiliser Association of India has done good work in publicising information related to utilisation of fertilisers, its technology and connected statistics.

PUBLICATIONS RECEIVED

Communication in Family Planning: Report on an Experiment by Kumudini Dandekar, Gokhale Institute of Politics and Economics, Poona. Published by Asia Publishing House. Pages 109. Rs. 12

Industrial Combination: A Study of Managerial Integration in Indian Industries by M. L. Kothari. Published by Chaitanya Publishing House, Allahabad-2. Pages 235. Rs. 18.00

Marketing Betel Leaves: Published by Gandhigram Rural Institute. Gandhigram. Pages 49

TAICHUNG :

Experience of an Orissa Farmer

NAROTTAM NANDA

IN view of the growing population in India it has become "necessary to make far greater use of modern methods of cultivation and to bridge the gap between demand and production by the application of the latest advances in the science of agriculture." As a corollary to this necessity, the core of the new strategy in agricultural production has come to be the introduction of high-yielding varieties of seeds.

Attracted by the news of the high yield-potential of Taichung Native 1 the farmer, under report, made his first attempt at its cultivation in the Kharif year of 1966 on an experimental basis. The farmer is a school teacher in the gram Panchayat of Sajanagarh in Balasore District, Orissa. He is an experienced and relatively big agriculturist.

The farmer knew that Taichung cultivation "demanded conditions in which waterlogging of the fields and inadequate drainage facilities do not exist." The land on which he made the experiment had no assured irrigation facilities. But the soil was such that it could remain at least wet for a fairly long period even if there were no regular rainfall in the rainy season. Moreover, the fields are so situated that excess water could be drained off easily without causing waterlogging. There is a tank near the

fields to be used as a safety valve for irrigating the fields in case they go dry.

Under these conditions he began his experiment in a land area of 0.30 acres. The result in this trial stage was so encouraging that in the post-harvest period of 1966 (that is, between January-March 1967), he extended its cultivation to 1 1/2 acres of land of the same locality. The neighbouring cultivators who had already been impressed by his success were induced by him to take up its cultivation. So in January-March 1967 an area of 10 acres came under Taichung cultivation. Thus, the farmer in question has become the initiator, demonstrator and propagator in his area. He made his attempts under less favourable conditions of unassured irrigation facilities. Hence, an analysis of the yield rate, costs of production and of the other experiences of the farmer is of significance to other farmers working under similar cultivation conditions.

Cost of Cultivation

The total cost of cultivating 0.30 acres was Rs. 106.00 made up of ploughing Rs. 16, cowdung and fertilisers Rs. 2, value of seed Rs. 4, weeding etc. 30 plant protection by pesticides Rs. 6 and harvesting and threshing Rs. 25. In other words, the cost per acre was about Rs. 350. The net output from the land according to the

This is a report of the experience of an Orissa farmer with the high-yielding Taichung variety. The author says that the farmer's experience disproves the idea that Taichung cannot be cultivated with profit except under conditions of assured irrigation facilities. However, since this requires larger inputs, the best results can be had through co-operative effort and provision by the Government of minimum facilities like free lending of pumping sets and digging of some deep tanks.

farmer was six quintals. This works out to 20 quintals per acre, over 2½ times the yield rate of six to eight quintals of traditional paddy seeds.

As stated earlier, the farmer extended Taichung cultivation to 1½ acres in the following *rabi* season. He was also attracted by the fact that the crop could be had in a short period of 3 months.

The cost of cultivation was Rs. 707 working out to about Rs. 470 per acre. The net output worked out to 16 quintals per acre.

The increase in the cultivation cost during the *rabi* season was because of the expenditure incurred on enclosing the fields, on watering the fields, and on using the method of planting the seedlings rather than sowing the seeds in the fields themselves. The fall in the yield rate during the *rabi* season was due to unforeseen storm and hail. Therefore, in effect, the farmer's *kharif* experience was confirmed in the *rabi* season.

These achievements of the farmer working under less favourable cultivation conditions compare well with the results obtained in the controlled fields that are generally provided with best cultivation conditions. The average yield of Taichung per hectare in controlled fields is estimated to vary between 31.1 and 39.1 quintals. In other words, its yield per acre varies between 12 and 16 quintals. The experiments

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in the controlled fields have revealed that "on an average, with adequate inputs, the Taichung should yield 20 quintals per acre with a cultivation cost of Rs. 300-400." Our farmer working under less favourable cultivation conditions incurs no greater cost per acre nor does he reap any lesser yield than in the controlled fields.

This disproves the idea that Taichung cannot be cultivated with profit except under conditions of assured irrigation facility. Being a 'drought-resistant' variety it can be cultivated in lands that depend on rain-water. The best period for its adoption in such lands is the post early-paddy season. In the *rabi* season too it can be cultivated with profit if the lands could be supplied with water even in a milder dose from any near-by tank or check-embankment. For reducing individual costs in irrigating the lands the farmers should persuade their Gram Panchayats to lend them pumping sets free.

The Difficulties

The farmer under report, however, pointed out certain difficulties with Taichung. It requires larger investment, more labour and greater care. It also demands continuous supervision over the crop. He said that under conditions of unassured irrigation facilities it is difficult for small farmers and average farmers with no subsidiary source of income to make independent and personal experiments with Taichung. The farmers can, however, make a co-operative attempt to adopt the crop.

For the consumer, preparing boiled rice from the husked/milled Taichung rice takes time, though its taste compares well with that of traditional varieties.

Taichung, as has been the farmer's experience can be adopted even in areas without assured irrigation facilities. But it needs the initiative of farmers with progressive outlook and the provision by Government of some minimum facilities, like free lending of pumping sets and digging of some deep tanks.

QUOTATION BOX

He (Gandhiji) was not an old book that could be reprinted again and again.

—Acharya Vinoba Bhave

The city fathers of Liverpool are thinking of starting a special bus service for drinkers... Drinkers will be instructed to leave their cars at home. At closing time, the "booze" bus will stop by to pick them up and drop them at their homes.

—An A.P. news report

Stalin's daughter, Svetlana, says she has received several proposals of marriage—including some from those who wanted to know if she wore false teeth.

—A Reuter report

It has been found that in the Vietnam war more than 150,000 Negroes are fighting in the U.S. ranks... In a five-city survey, the *Washington Post* found a widespread belief in the 'ghettos' that... the war is to secure "freedom" for the Vietnamese not enjoyed by the blacks in the U.S.A.

—Mr. Selig Harrison in
"The Washington Post"

It is easier for me to get rid of my wife through alimony than to get rid of my employee.

—Mr. Naval Tata

A new born child has been christened Bandhini after today's Kerala Bandh.

—A U.N.I. report

The President's latest ordinance made headlines. Breadcrumbs get longer still.

—"Now"

President Johnson has completely stopped taking alcohol and smoking and says he never felt so fit as now.

—C.R. in "Swarajya"

But in Europe and North America it would be a great asset to own a machine that possesses the senses of touch, sight and smell, and is capable of making beds, cleaning the house, laying and clearing the table, and even looking after the baby. Added to which it does not go on strike, cannot ask for more pay, requires no holidays, will not steal the silver, and can be traded in on the easiest of hire-purchase terms as soon as an improved model becomes available.

—A Ditcher's Diary in "Capital"

British hypocrisy may be hard to surpass, but Chinese hypocrisy in fact beats it hands down. Macao, now under the domination of the prudist Red Guards, who denounce the "decadence" of Hong Kong daily over *Radio Villa Verde*, is going to put on a series of shows with nude girls.

—Traveller's Tales in
"Far Eastern Economic Review"

Dr Edmund Overstreet, Professor of Obstetrics and Gynaecology at the University of California Medical School, San Francisco, said, the number of illegal abortions in the United States was somewhere between 300,000 and 2,000,000 per year and a safe estimate would probably be 1,000,000—which meant that one out of every four to five pregnancies ended in induced abortion.

—"International Planned Parenthood News"

India's Image Abroad

(from Page 21)

problems of far-away lands when their own domestic problems cannot be settled for lack of money and imaginative, bold leadership.

Besides, those Americans who visit India frequently ask questions which are difficult to answer. Why can't the well-to-do share their food with the poor? Why do the surplus States refuse to part with their grains? Why can't India manage a better distribution system? Why can't India dehoard the foodgrains stocked away by unscrupulous traders, merchants and peasants?

Now that India has had a good monsoon and the long spell of drought has been broken, will it be too much to expect our leaders to agree on our fundamental theme for 1968: NO MORE FOOD IMPORTS? Only a decision like this could change the current Indian image in this part of the world. If our food statistics are correct, we should be able to do with what we produce, even if it means a little hardship for all of us.

And, finally, must we allow complete freedom to all foreign journalists and TV teams in India to project India in whatever way they like? We must not introduce censorship, but should we not seek to get the true picture across?

THIS IMAGE OF INDIA HAS TO BE CHANGED

BHABANI SEN GUPTA

MOST Indians in the United States or, for that matter, in England, are distressed by the image of India which has sunk deeply into the Western mind: the image of a large country of teeming, hungry millions who are an unwelcome draft on the wealth and affluence of the Western world. It is time India did something to change this image. This cannot be done by external propaganda. It can only be done by a few bold decisions in India, by Indian leaders in government and in the opposition parties.

On September 14, the fourth day of my arrival in New York, I was astounded to see on the TV a much advertised feature on India. It was a film taken some 18 months ago, long before the general election, and was unabashedly presented as a report on "The World Tomorrow." It showed the land in Bihar, parched and dried up for lack of water, an old woman making cowdung cakes, and hundreds of men, women and children described as "hungry". Only an Indian would know that they did not *look* hungry; to the American viewer, the moanful commentary bore the message of truth. The entire feature went on without a single word of hope or a single sentence of what India has been able to do during the last 20 years to build up her economy. Americans have been made to believe that India is a "bottomless pit."

During a week's stay in London, on my way to New York, I came across the same massive misinformation about India. Thanks to the British Press and Television, most Britons believed that the only thing India could assemble in 20 years was mass hunger! And

whenever I met an Indian living in London, I heard the anguished question: "Are conditions in India really as bad as what we read in the Press?"

Theme of Hunger

It seems this unhappy image came to be built in the following way, at least in the U.S. In our bid to get foodgrains from the U.S., we played the theme of hunger, and the American agencies of mass communication, in quite good faith to begin with, overplayed it in order to build up public sympathy. American correspondents stationed in India, like their other Western counterparts, sent in gruesome reports of people dying for lack of food and the TV networks sent out teams to report on hunger and misery of the Indian people. Indian hunger became "news", and since it is difficult for the work-a-day journalist to reconcile hunger with even a modest degree of economic advancement, the positive side of the Indian story was allowed to fade away. To build on the theme of hunger, India *had to be* presented as a country incapable of managing her own affairs, and far too dependent on American bounty.

The damage has been done, and it will take us years to undo it. Perhaps in 1966 it was necessary to project to the U.S. and other affluent countries the successive failure of the Indian monsoon and the resultant shortage of food; especially so because the present Administration in the U.S.A. is less altruistic than we would like it to be in the matter of supplying foodgrains and in the larger realm of foreign aid. Also, the demand on

American grain surpluses, which are not as large this year as they once used to be, is heavy and comes from a host of countries.

But the question is: why did we allow it to be overplayed? For overplayed it indeed has been, to the extent that the average American has got quite tired of it, and has come to regard India as a permanent draft on his none too bountiful national resources.

The United States is currently facing a grave internal crisis. In order to eliminate all the real and potential causes of tension and conflict in the U.S. society, what this country needs is a massive programme of public welfare—millions of housing units, millions of jobs, better education for the depressed sections of the community, a vast programme of job-training and huge public works programmes involving millions of people. To do this the U.S. needs billions of dollars and there is the fundamental question, debated daily in innumerable forums, whether, even if the money is available, this should be done under public initiative or through private enterprise given a high rate of profit. The fact, however, is that the billions of dollars required for this welfare programme are nowhere to be found unless the war in Viet Nam is called off. The war has led to a constriction of foreign aid funds and of allocations for urban development. The race riots have led Congress to cut down funds for community welfare. And some of the serious journals as well as a host of economists have been pointing out that the U.S. happens to be the only industrialised country in the world without a worthwhile social security plan, without any old age or family allowances.

No Time for Others

This is not the time or the occasion when one can expect Americans to be really sympathetic to India's, or any country's, problems of hunger. Americans would not like to be burdened any more with

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MORE RICE AND FISH FROM SUNDERBANS

TUSHAR RANJAN PATRANABIS

A cost-benefit analysis of the Sunderbans Delta Project, made recently by the Calcutta Metropolitan Planning Organisation, envisages additional production of 4.5 lakh maunds of paddy and 37,000 maunds of fish.

These benefits are expected to accrue from the sixth year onwards after the implementation of the Rs. 18.75 crore ten-year project begins. From the sixth year, however, an additional 20,000 acres are likely to be brought under the plough and 725 acres of water area under pisciculture.

The portion of Sunderbans lying in West Bengal covers 3,100 sq. miles. Characterised by numerous creeks and inlets, about 1,400 sq. miles of the area have been reclaimed by over 2,000 miles of embankments. But the resulting protection has been very limited. During abnormal cyclones, saline water tops over the bunds and inundation causes frequent damage to crops and property. Reconstruction of the bunds has not been found financially feasible owing chiefly to the limitation posed by the local clay.

A Master Plan to tackle the problem has, therefore, been evolved. It consists of three phases: in the first phase, closure of the Saptamukhi river will be attempted; the second phase will take care of Gobadia and Calchara; while the third and last phases will see the closure of the Thakuran system.

The first phase will be described here leaving the other two; for benefits have, for the present, been calculated for this phase alone in the C.M.P.O. study.

The closure of the Saptamukhi comprises about one km upstream

of the junction of the Namkhana creek, nearly 9.5 km from the sea-face, along with two subsidiary closure dams, one across the Gobadia link channel near the Gobadia junction, and the other across the Saptamukhi at the upper end below the junction with the Gobadia link channel. The project includes construction of 75 km of marginal dykes and five master sluices.

A reservoir with full capacity of 104 million cubic metres is an important feature of the project. Water will, of course, remain saline in the first year after it is impounded in the enclosure, but can be used for irrigation and fisheries as well as domestic and industrial purposes with progressive desalinisation.

The bund of the reservoir is planned to be 45 km. The total length of the dyke will, therefore, be 120 km (75 km marginal embankment and 45 km for closing the reservoir). Thus the area will be provided with 120 km road throughout the length of the dyke with two lanes of traffic.

The five master sluices will alleviate the existing drainage congestion because the present sluices are too small to drain out rain water and waterlogging is a common experience with the attendant evil of crop damage.

The total area of the enclosed land is 1.25 lakh acres. Of this, rivers and creeks cover 800 acres; existing beels and other water-bodies total up to 3,644 acres; the proposed reservoir spreads over 6,250 acres. Thus the total area under water after the completion of the first phase is expected to be 10,694 acres. The net available land for cultivation after excluding the water-bodies and residential

land may add up to one lakh acres. At present, about 80,000 acres are under the plough. Additional land fit for cultivation within the enclosure may thus come up to 20,000 acres. At a modest estimate, the results of cultivation on this additional land as well as land freed from waterlogging may start showing from the sixth year, and may total 4.5 lakh maunds of paddy worth Rs. 76 lakh at normal rates.

Fish culture on the enclosed water area may also begin showing results from the sixth year. It is expected that in 725 acres of additional water area about 37,000 maunds of fish would be available. At the current market price, the value of this quantity may be anybody's guess, but even at the moderate wholesale rate of Rs 115 a maund, it would exceed Rs 42.5 lakh.

Another significant advantage from the project lies in the avoidance of the existing recurring expenditure on maintaining temporary bunds, because most of the expenditure now incurred appears to be infructuous. During 1964-65, for instance, the total value of the damage was estimated at Rs. 2.15 lakh. The annual maintenance expenditure of the embankments and the small sluices is about Rs 13 lakh.

The density of the area according to the 1961 census was 690 per sq. mile compared to the average rural density of 789 for the State. According to the CMPO's projection of rural population of West Bengal, the rural density may go up to 1,238. In view of the fertility of the Sunderbans and its nearness to the Calcutta Metropolitan District and the projected port town of Haldia, one might expect a higher density in the Sunderban area than over the State. The scope for employment in agro-industries and the tertiary sector can be expected to be considerably higher than the State average due to its advantageous location.

A Punjab Village Knows No Farming Plan

MUKHTAR SINGH AULAKH

A study of a gramsewak circle in Dehlon Panchayat Samiti in Ludhiana district was undertaken to see how the farmers have responded to the idea of each village preparing its farm output plan and of developing the whole village as a unit, mobilising all resources in men and material. Twenty one cultivators were chosen at random for interview. It was ensured that at least 10 per cent of the total cultivators in each village were represented in the selected sample.

It was found that 81 per cent of those interviewed were not aware of the preparation of village plans and setting up of production committees and were not associated with these plans in any way. The remaining 19 per cent were aware that the plans were being prepared but no production committees were set up to formulate and implement them.

The items which formed part of the agricultural production plan of the village were: increase in area under cultivation by reclamation; increase by minor irrigation; use of improved seeds; extension of green manuring; composting; fertiliser application; soil conservation works; adoption of improved agricultural practices; poultry keeping; fruit plantation; plantation of fuel trees and installation of "gobar" (cowdung) gas plants; fish culture and village cattle improvement. All the items except a few like fish culture, cattle development and reclamation required individual action, because these could be better attempted through individual initiative. The people interviewed said the village plan should have covered only such common programmes as were beyond the control of farmers as individuals. This means that individual-oriented action programmes like improved seed and use of fertilisers need to be implemented in terms of spirit of competition because in case of such farm activities, the farmers

strictly take an individualistic view.

It was revealed that the problems of drainage, transportation, supply of production elements, consolidation, electrification and canal water require the help of other village people. The nature of these items is such that the resources of individual farmers are inadequate for their solution and further the farmers are conscious that these items could be solved only with organised group action. The village plan should have covered only such programmes and activities. In matters like

drainage, transportation, electrification and supply of production requisites, there is need for co-ordinated action by more than one village.

Thirty eight per cent of those interviewed were of the view that village panchayats could not tackle agricultural programmes, while 62 per cent felt that panchayats should be entrusted with a few common agricultural programmes. Regarding the non-agricultural programmes, 71 per cent were in favour of entrusting all such programmes to panchayats, but the remaining 29 per cent thought that only a few such programmes should be entrusted to them.

A Rajasthan Village Is 80% Indebted

A COLLEGE STUDY

A survey was conducted by the Planning Forum, Government College, Kota, of the village Ankodia about 13 kilometers from Bundi. The village has a population of 1000. It is connected only by a fair weather road with Bundi. During rainy season it is almost inaccessible. For the survey 35 households were selected.

The economic condition of the village was miserable. Most of the families depended on agriculture. Some families had subsidiary occupations such as cattle breeding, manual labour, tailoring, poultry keeping, hair cutting and carpentry.

The 32 households with agriculture as their primary or secondary occupation had 380 bighas of land. Out of this land, 210 bighas were irrigated and 170 unirrigated. It was divided into 86 holdings of different sizes ranging from 15 bighas to less than a bigha. Main source of irrigation was the wells, and inundation canals.

Most of the villagers raised two crops on irrigated land. Important crops are wheat, jowar, maize, sesamum and gram. Also crops like barley, linseed, moong, urd, jira and sugarcane were grown. They never used chemical ferti-

lizers. However they used indigenous manure. They had no idea about improved seeds. Monthly income of 75 per cent of the villagers was less than Rs. 150.

Nearly 80 per cent households under review were in debt. They borrowed either from Mahajans or their relatives. The maximum debt recorded in a single family was Rs. 3500. The normal rate of interest ranged between 12 to 36 per cent per annum. Most of the families had taken loans for unproductive purposes such as marriages and religious rituals and repair of residential houses. Loans were also taken for construction of drains, drawing fences, and purchasing indigenous manures.

On an average a family spent nearly 70 per cent income on food articles. wheat, jowar and maize formed the staple food. They used rice and sugar only during festivals and marriages. Also they spent some amount on edible oils, tea and gur. Smoking was another item of expenditure.

Hardly 50 per cent children of school-going age attend schools. Medical facilities were not available. The villagers had not heard about the Five Year Plans. Hence the need for immediate steps to arouse plan consciousness among the masses.

FAMILY PLANNING PUBLICITY NEEDS PERSONAL TOUCH

AMIT KUMAR GUPTA

If we really are for family planning let us be practical about it.

While credit must be given to the Government for boldly undertaking population planning, there appears to be a serious flaw in the publicity approach. A recent survey by a Lucknow University researcher revealed that even the urban middle class was not aware of the facilities offered by the Government. Consider the copy of posters, for example. Slogans like "Two or three children only" are practically useless. A better proposition would be to give information about the places where the public can get attention, medical or otherwise, regarding family planning.

Other types of posters should give, in a pictorially graphic man-

ner, some stark statistics which will bring home to the citizen the urgent need to plan his family.

Cinema slides require an entirely different type of copy since they are flashed only for a very brief period on the screen. Hence their message has to be brief and precise and hold the viewers' attention. The slide should be pictorially neat and attractive.

In all types of publicity, whether it be the poster or slide or a film short, the best effect can be achieved only if the personal factor is stressed. To the average beholder, statements about peril to the nation have little emotional appeal. The message of family planning will find acceptance only when the publicity is directed towards the personal interest of the individual.

The best method of propagating family planning would be a house-to-house campaign. Since this

would involve an extensive field service, the co-operation can be sought of senior students, social service organisations, service clubs etc. In rural areas the panchayats should be brought in and in the very fertile labour colonies the work can be best done through the trade union leaders. The main point to be understood here is that it is not possible for the regular staff of the Family Planning Directorates to undertake all the field work. The active co-operation of the enlightened and influential sections of the public must be sought.

Some of the antagonism towards the idea of family planning has been generated because only the birth control aspect has been stressed. No doubt this is the most important, but there are other facets like proper child care and hygiene. One of the best ways of popularising family planning clinics is to hold lectures and demonstrations about proper child care. As added incentive, "healthy baby" contests could be periodically held, with good publicity being given to the winners.

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Development Diary

September 5 to October 4, 1967

September 7

The aluminium plant, set up in the private sector near Madurai with West German collaboration, begins production. The plant has a capacity to produce 360 tonnes of aluminium powder every day.

September 12

India and the U.S.A. sign an agreement in New Delhi under which India will get one million tonnes of American wheat and milo, besides 70,000 tonnes of vegetable oil and 30,000 bales of extra-long staple cotton under PL-480.

An agreement is signed in Bombay for the establishment of a display centre in Paris to help boost the sale of Indian small-scale industries products in Europe. The centre is to be named 'Trimurti'.

September 13

Two new contracts between the Bharat Heavy Electricals and the Czechoslovak firm, Skoda Export, are signed in New Delhi. Under the agreements the Czechoslovak firm will collaborate in setting up a heavy electrical power equipment plant at Ramachandrapuram near Hyderabad.

Work begins on the naphtha refining unit of the fertiliser complex at Rourkela.

The World Bank announces a \$25 million loan to the Industrial Credit and Investment Corporation of India. The loan will be guaranteed by the Government of India.

September 15

The Film Finance Corporation has introduced a new scheme to give financial assistance up to Rs. 1,00,000 for the purchase and import of new production and projection equipment.

September 19

The Posts and Telegraphs Department decides to open a text book bank for the benefit of the dependents of its employees.

A document providing for preferential customs facilities for trade exchange is signed in Belgrade by the representatives of India, Yugoslavia and the U. A. R. More than 250 products will be covered by the preferential customs facilities.

September 20

India has been authorised by the American State Department to purchase a total of 3,30,000 tonnes of American wheat. This is the balance of 9,00,000 metric tonnes of wheat India is to purchase under an agreement with America.

September 29

Two agreements are signed in New Delhi between the Government of India

and French firms for setting up an oil refinery at Haldia. The refinery, to be set up in the public sector at a cost of Rs. 46 crore, will have a capacity of 2.5 million tonnes annually.

The third unit of the State-owned Koyali refinery in Gujarat is commissioned. With the addition of this one-million tonne unit, Koyali becomes the biggest among the public sector refineries.

October 4

India and West Germany sign an agreement in Bonn under which India will get 250 million Mark (Rs. 47.25 crore) as aid from West Germany.

Looking Back

Yojana October 20, 1957

We shall look at some telling facts about the textile industry in India. The capital invested in the industry is estimated at Rs. 115 crore and it produces manufactured cloth of the total value of Rs. 400 crore every year. The labour employed by the industry is estimated at about 750,000 workers. The textile industry utilises almost the entire cotton crop of India estimated at 50 lakh bales; but this is not sufficient, and so 8 lakh bales of long staple cotton worth over Rs. 200 crore are imported. The industry consumes over 2 million tonnes of fuel which includes coal, charcoal and firewood, about 50 million gallons of fuel oil and about 900 million Kwh of electricity valued at Rs. 11 crore. The textile industry has encouraged the establishment of various auxiliary industries like the manufacture of Bobbins, Spindles, Healds and Reeds, Starch, etc. and provides employment to a large number of workers in transport. It supports a large number of general insurance companies and banking institutions and provides occupation for no less than 15 lakh handloom weavers by supplying yarn to them. It pays annually Rs 90 crore as wages and provides an average earning of Rs. 1,600 a year to a textile worker, as compared with the per capita national income of Rs 272 in 1955-56. These facts are sufficient to prove that textiles has an undisputed claim to be reckoned as India's principal industry.

Yojana Bhavan Diary

THE Planning Commission has addressed a letter to State Governments, laying down the basic objectives of the Annual Plan for 1968-69 to ensure stability in prices to the extent possible and to secure a feasible rate of growth without generating inflationary pressures. The Commission has also requested the State Governments to give details of their financial resources for the Annual Plan 1968-69.

Indicating the guidelines for the preparation of the Draft Annual Plan, the Commission has suggested that the State Governments should make an assessment of the progress, both in financial and physical terms, of the Annual Plan 1966-67.

The Planning Commission met from September 19 to September 22 and discussed various aspects of the Plan. It discussed problems regarding future food policy, foreign investment and foreign collaboration in the light of the Mudaliar Committee recommendations.

Mr. R. Venkataraman, Member (Industry), left for New York to attend the session of the United Nations' Administrative Tribunal commencing at New York from October 2. Mr. Venkataraman is the Vice President of the Tribunal.

Dr. S. R. Sen, Additional Secretary, Planning Commission, is taking over as Adviser, World Indicative Plan, F. A. O., on October 16. He is going on deputation for six months.

Mr. M. Butt relinquished his services as Joint Secretary, Planning Commission on September 30, and Mr. G. C. Baveja joined as Joint Secretary on the same day.

Mr. P. K. J. Menon has been appointed Planning Adviser for both Bihar and U. P. So far he was Planning Adviser to Bihar only.

Among the foreign visitors who met the Deputy Chairman, Dr. D. R. Gadgil, were Prof. Daniel Thorner, Institute of Economics, University of Paris (September 21) and Dr. Mahmoud Fawzi, Vice President, U. A. R. (September 25).

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AS/8/45/67

A COMPARATIVE PICTURE OF THREE ANDHRA PROJECTS

J. L. SAAZ

RURAL INDUSTRY



A YOJANA SUPPLEMENT

THERE are three Rural Industries Projects—Anantapur, Nalgonda and Narasraopet—in Andhra Pradesh. These projects together cover an area of 5,646 sq. miles and a population of nearly 14 lakh. Though differing in resources, a common feature of all these projects is that agriculture is the mainstay of more than 80 per cent of the population, and that manufacturing activity provides work to only a small percentage of the working population. The main food and commercial crops of Anantapur Project, which is rich in mineral resources, are paddy, jowar, bajra, kerra, ragi, groundnut and cotton. The general landscape of Nalgonda Project is arid and rocky. The land, poor in fertility, produces paddy, jowar, bajra, castor, groundnut and

chillies. Narasraopet Project, on the other hand, is comparatively rich in agricultural produce, the important crops being paddy, millets, tobacco and chillies. With the irrigation facilities being made available from Nagarjunasagar Dam, the crop pattern of the

area is likely to undergo a change for the better, and as such it holds great promise for establishment of agro-industries.

The implementation of the industrialisation programme in these projects started in 1963-64 resulting in considerable progress

S. No.	Name of the project	Expenditure till 31-3-1967	(Rs. in lakh) Provision for 1967-68
1.	Nalgonda	20.85	7.72
2.	Anantapur	20.53	8.00
3.	Narasraopet	19.69	7.80
4.	Central Office	1.38	0.48
Total :		62.45	24.00

Cone mill at work in the Government Paints and Varnishes Unit at Bhongir (Nalgonda Project)



in the improvement of skills and earning capacity of the artisans as well as in the creation of new employment opportunities.

A total expenditure of a little over Rs. 62 lakh had been incurred on these projects till the year 1966-67. The break-up is given in the table above.

VARIOUS SCHEMES

Out of a total of Rs. 20.85 lakh in Nalgonda Project, Rs. 7.48 lakh were spent on loans to industrialists, Rs. 2 lakh on subsidised supply of improved tools to artisans, Rs. 4.85 lakh on Common Facility Centres, Rs. 2.75 lakh on departmentally-run commercial schemes, and Rs. 0.95 lakh on training programmes. In the Anantapur Project, loan schemes accounted for an expenditure of Rs. 8.37 lakh, subsidy schemes Rs. 2.19 lakh, Common Facility Centres Rs. 5.17 lakh,

commercial schemes Rs. 2.52 lakh, and training programmes Rs. 0.26 lakh. Almost the same pattern is repeated in the Narasraopet Project where Rs. 6.47 lakh were spent in granting loans to industrialists, Rs. 1.78 lakh on making improved tools available to the artisans, Rs. 5.71 lakh on Common Facility Centres, Rs. 1.94 lakh on departmentally-run production centres and commercial schemes, and Rs. 0.24 lakh on training programmes.

2031 GET LOAN ASSISTANCE

During the four years under review (1963-64 to 1966-67), as many as 2031 entrepreneurs and artisans (1121 in Narasraopet, 518 in Nalgonda and 392 in Anantapur Project) availed themselves of the loan assistance which aggregated to Rs. 22.32 lakh. The number of artisans who were equipped with kits of improved tools and appliances on 75 per cent subsidy basis, comes to 3228—1230 in Nalgonda, 1154 in Narasraopet and 844 in Anantapur Project. Expenditure under this head was of the order of Rs. 5.78 lakh.

Under the training programmes emphasis was laid on imparting of new skills and improvement of existing skills so as to raise the levels of incomes of artisans. The *modus operandi* of the scheme has



Assembling an oil engine in a workshop at Bhongir

been to select suitable candidates and arrange their training at reputed institutes and craft training centres in and outside the State for a fixed period (generally for six months) on a reasonable maintenance allowance. On completion of training, these persons are helped to esta-

blish themselves in the trades they have learnt by providing financial and technical assistance where needed. In this way, 223 persons (97 in Nalgonda, 62 in Anantapur and 64 in Narasraopet Project) have been trained at a cost of Rs. one lakh.

KOZHIKODE MAINTAINS MOMENTUM

CREPE FROM SCRAP RUBBER

The crepe milling factory set up at Cheruvannur is a resource-based industry. The three districts of the erstwhile Malabar area have an annual production of about 5,000 tons of scrap rubber. Considering the fresh areas recently brought under rubber cultivation, the production of scrap rubber is likely to go up to 25,000 tons in another five years.

The scrap rubber has to be milled and converted into crepe rubber for use by manufacturers. All the existing 14 crepe mills in the Kerala State are situated in and

around Kottayam town which is about 300 km. away from Kozhikode. The scrap rubber from Malabar area is transported to Kottayam for milling. The existing mills at Kottayam are hardly sufficient to meet the demands of the erstwhile Travancore-Cochin area. It was against this background that the Kozhikode Project sponsored the establishment of a crepe milling unit at Cheruvannur.

The factory with a capacity to manufacture 5 tons of crepe rubber per day has been set up by M/s. Quality Millers, a partnership concern, with the Project assistance of Rs. one lakh as long-term loan for factory construction, and Rs. 91,000

for machinery on hire-purchase terms.

WOOD SLATS FOR PENCILS

Atul Wood Products is a sister concern of the United Pencil Industries, which manufacture 43,200 gross of various types of pencils per annum. The United Pencil Industries, the only pencil manufacturing unit in the erstwhile Malabar area, was dependent upon imported wood for the manufacture of their chief raw material, viz., pencil slats. The quantity of imported wood was insufficient to

turn to PAGE 32

CASHEW INDUSTRY GETS A BOOST

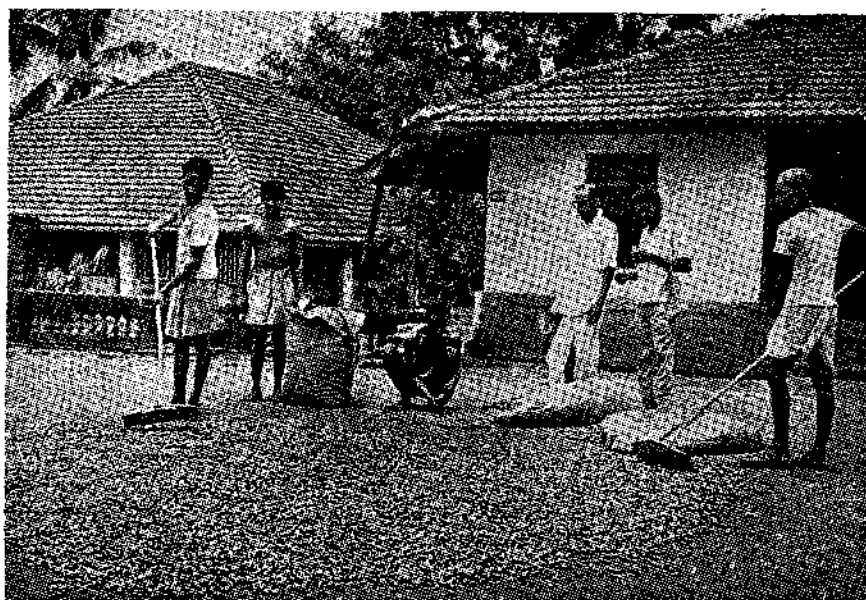
VENGURIA Rural Industries Project comprising five community development blocks, namely Vengurla, Malwan, Sawantwadi, Kudal and Kankavali of Ratnagiri district in Maharashtra State is situated on the west coast of the country, covering an area of 1510 sq. miles. The project area lying parallel to the Arabian Sea on the west and the ranges of the Western Ghats on the east, gets the highest annual rainfall of 293" at Amboli and the lowest of 84.9" at Malwan. Over 85 percent of the land surface is hilly, being projections and offshoots of the Western Ghats. The soil is laterite, which being porous, is not retentive of moisture. 'Warkas' lands situated on the slopes of the hills have to be left fallow for four to five years for accumulation of soil. More than 95 per cent of the area is under rice cultivation in Kharif season. The sea-coast area is under fruit trees

(Right) Deshelling of roasted cashew seeds

(Below) Drying of cashew seeds in the open



**1250 workers, mostly
women, get work in
nine factories**



viz., coconut, mango and cashew and a major portion of the population depends on these crops for work and earnings. Due to the paucity of resources and inadequacy of the land to support them, there is a constant flow of working population, particularly men, to the city of Bombay.

Against this background, the Vengurla project undertook systematic exploitation of horticultural resources, especially cashew nut cultivation and processing, as the economic development of this area is linked with the growth of this industry.

Before the Project came into being there were five cashew processing factories in the area. The Project has encouraged this industry with financial assistance, and technical and other guidance. This has resulted in increase in the number of factories to nine. The reasons for laying so much stress on this industry are obvious. In the

(Continued on Page 32 Col. 3)

MORE UNITS IN KOZHIKODE PROJECT

(Continued from page 30)

carry on production continuously. With the imposition of restrictions on the import of pencil wood, the entrepreneurs embarked on this new venture to meet not only their own need but also the demand of other pencil manufacturing units. When in full production Atul Wood Products will be able to supply indigenous pencil wood to the pencil manufacturers throughout India and thus be instrumental in conserving foreign exchange.

The Project has sanctioned a long-term loan of Rs. 32,400 towards construction of factory building, and Rs. 65,100 for machinery on hire-purchase basis. The factory will, in the initial stages, give employment to 20 persons.

STEEL RE-ROLLING MILL

A steel re-rolling mill to manufacture steel rods and squares from scrap, which can be had from the existing rolling mills in Kerala and also from the railway authorities at Olavakkot and Shernur, has been set up at Cheruvannur with Project assistance.

Even though there are two rolling mills in Kerala State, large quantities of bars and rods are presently being imported from other States, and in some cases from such far away places as the Punjab and West Bengal. The main items proposed to be manufactured by this mill are rods with smaller gauge (5 mm to 7mm) and squares with dimensions 6mm to 10mm, which are not rolled in the mills in this State at present. Construction works in this state are greatly hampered for want of lighter sections, and small-scale industrial units using squares for fabrication purposes are always starved for want of raw materials. Under the circumstances, there is very good scope for such a mill which is meant to fulfil a long-felt need in this area.

The Project has advanced a long-term loan of Rs. one lakh for construction of factory building.

The State Bank of India has, on the initiative of the Project, agreed to supply machinery worth Rs. 2.20 lakhs, under their hire-purchase scheme.

This factory involving a fixed investment of Rs. 4 lakh will provide employment for 50 persons, and produce rods, squares, etc. at the rate of 5 tonnes per day in single shift.

PLASTIC MOULDED GOODS

There is a very good demand for plastic moulded goods such as soap cases, cups and saucers, lamp shades, etc. in Calicut district. Most of this demand is being met at present from outside the district, notably Bombay.

The Project authorities encouraged an entrepreneur, Mr. A. P. Veerankutty, to set up a unit for the manufacture of plastic moulded goods. The entrepreneur was sent on a study tour to Bombay where he visited a number of such factories. He came back with a concrete plan to establish a plastic moulding unit of his own in the Project area.

Zeena Plastics at Elathur, 8 Kms north of Calicut, is the result of this Project initiative and private enterprise. The unit set up with a fixed capital investment of Rs. three lakh was given liberal financial assistance—Rs. 30,000 as long-term loan for construction of factory building, and machinery worth Rs. one lakh on easy hire-purchase terms. The only unit of its kind in north Kerala, Zeena Plastics will provide employment for 30 persons.

AUTOMOBILE SPARE PARTS

A survey of the resources and needs of the Project revealed that various automobile spare parts, were imported in the district from outside the State in large quantities. The survey also revealed that most of these items were fast moving ones. This offered scope for the setting up of a unit to manufacture some of the items.

A unit to manufacture a few items such as kingpins, shackle bolts, shackle pins, etc. involving a fixed investment of Rs. 4 lakh was sponsored by the Project, and has since been set up at Kakkodi in a typical Kerala rural setting, 8 kms. from Kozhikode.

It is a partnership concern with Mr. M. N. Sankaranarayanan, an automobile engineer, as the Managing Director. The partners have wide contacts with all the established fleet owners in South India and as such the new unit is not likely to face any marketing problem.

Towards the fixed capital requirement, the Project has already advanced Rs. one lakh as long-term loan for factory construction and machinery worth Rs. one lakh on hire-purchase terms. The balance has been raised by the entrepreneurs themselves. One of the machines (a centreless grinder) supplied by the Project has been imported from the U.S.S.R.

CASHEW INDUSTRY

(Continued from page 31)

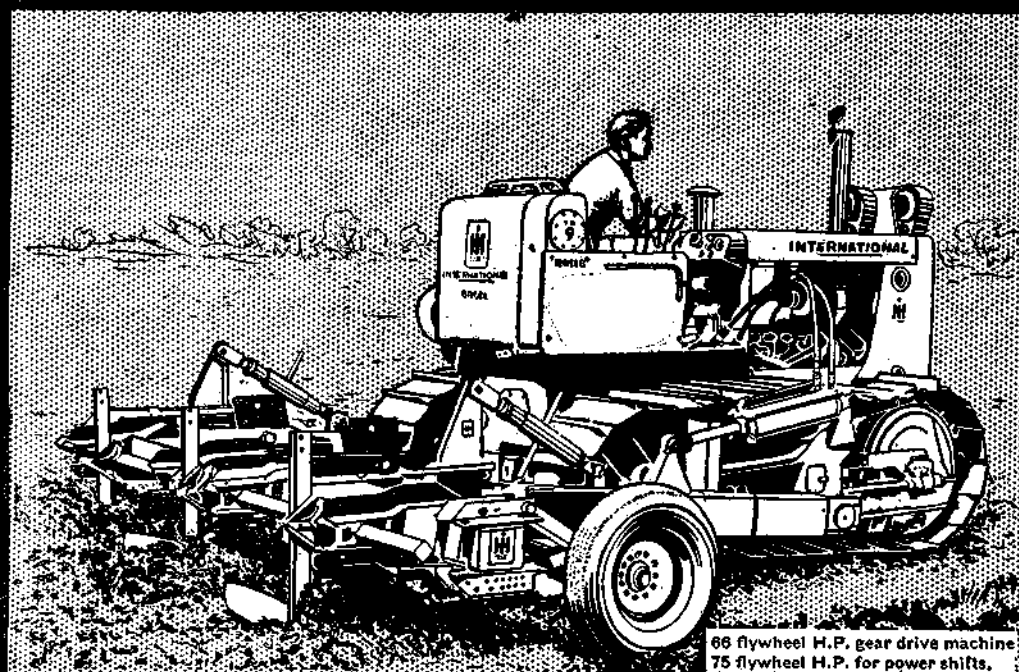
first instance it is resource-based. Secondly, it is labour intensive and thirdly, it is dollar-earning.

The total area now under cultivation of cashew plantation is about 8,500 acres. The estimated production can be taken at 6,375 tonnes at 3/4 tonne per acre approximately. The actual annual production is, however, restricted to only 1,610 tonnes. The number of workers engaged in the organised sector of this industry is about 1,250. Eighty per cent of these workers are women who do the work of beating, grading, peeling, etc. The factories working at Vengurla are producing cashew kernels by the roasting process. As most of the cashew oil is wasted by this process, the Project is considering to introduce oil-bath process, by which cashew oil will be recovered alongwith the kernels as is being done in Kerala.

The Government of Maharashtra has launched an ambitious plan of cashew plantation through Forest Department and Soil Conservation Department in an area of three lakhs acres in Ratnagiri district. This will provide raw-material for more cashew-nut processing factories which would come up in future in this Project area.

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are a few... These dairies range in capacity from 50,000 to 5,00,000 litres of milk a day. UNICEF assistance for plant and equipment will be repaid by distribution of milk at subsidised rates to children, expectant and nursing mothers for a given period of years.

For the First Amul Dairy and the dairies at Worli, Hyderabad and Madurai, L&T carried out the entire mechanical and electrical installation including piping, testing and commissioning.

For Vijayawada Milk Products Factory, L&T will be installing a Niro Atomizer spray drying plant—the second milk powder plant in India to be put up with UNICEF aid.



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GODS DECIDE BUT MEN DEBATE

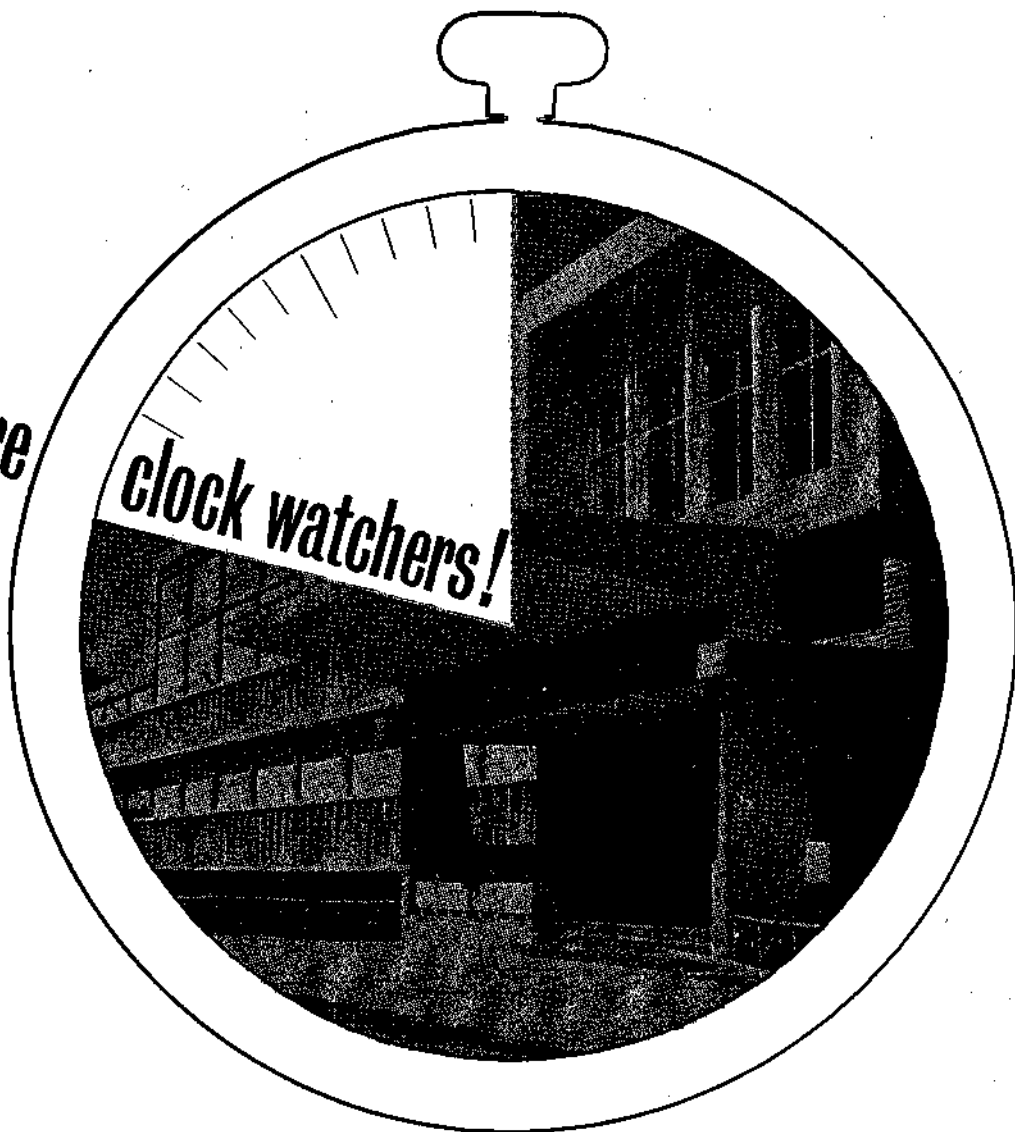
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THE food argument, in the end, is between the desirable and the possible. A national food policy is easier said than done. If the attractive food budget idea has not gone through, it is not for want of trying. Producer levy, sensible in itself and complete as a solution, is postulated on a degree of administrative efficiency and honesty which is far beyond achievement, now or in the near future. Similarly, on prices what appears to be rational in theory fails in practice.

When the dust of battle settles down, one will wonder what the fighting was about. For, barring the outer fringe of opinion, all are agreed on what would be ideal. If there had been no faith in national food policy, there would not have been all these conferences marked by the earnest participation of the Chief Ministers. On prices there is an inevitable compromise and nobody claims that it is not so. What perhaps is claimed—and with justification—is that the compromise is both honest and practical.

The largest agreement so far has been over procurement targets. There is a very genuine difference of opinion on how best this can be done. Each favourite idea has its peculiar drawback and there is no real harm in trying a combination of methods to get the best result. Two points, however, need to be emphasised. One is that the higher prices should reach the farmer. Secondly, since the farming community is large, even a few quintals retained by each farmer in excess of his requirements can, on a national scale, wreck the public distribution system.

There can be and, in fact, there are no two opinions on the need to do away with imports as quickly as possible. As a goal to be reached

in less than five years, this involves basic effort to raise more from our land. Immediately, imports cannot be avoided altogether, though the quantum is bound to be smaller than before, because of better supplies position at home and lower stocks abroad.

The building of buffer-stocks, as both the Planning Commission and the Food Department have emphasised, is the pivot of policy. A buffer can pave the way to relaxing zonal restrictions. There is no ideology involved in this. If there had been some loud thinking on relaxing them now, it was only because smuggling was reducing their usefulness, and it was thought that with a large crop some experimentation was worth making. But the idea was given up once the States put forward their preference, basing it on the needs of procurement efficiency.

Relaxation of zonal restrictions is not the same as a free economy in foodgrains and of this there is no chance at all now. The minimum controls will remain and, perhaps, in the days to come, the trend would be towards greater social control. Very possibly, a good crop may give the planners and the executive just that elbowroom for manoeuvring a larger control policy.

On prices there is an attempt to bring about parity between surplus and deficit States so that the producer States are not penalised for their efficiency. After this is said, one cannot help pointing out that an over-zealous correlation of prices and procurement may lead to pampering. While one may concede the need to compensate the farmer for his investment in the New Technology, one must also recognise the immense increase (or at least the prospect of such increase) in his earning from the New Technology

and also the considerably larger State aid. Much of this has come from the whole community which has every right to expect that the rural sector meets its social obligations. It is about the least taxed sector in India.

What really matters now is the efficiency of purchase arrangements. The Food Corporation, whose sales turnover has been steadily rising, must be enabled to operate to its full capacity.

Finally, if there is politics in food, it cannot just be eliminated by sermonising. This is a factor to be reckoned with, nor to be lectured away. The States, in our federation, are there in their right. Politically, the issues have been less between parties than between States. Within the States, most of the parties have similar attitudes on procurement, prices etc. Thus here again, what is reflected is the essence of the federal scheme. A federation creates problems, but is anyone going to suggest that the country be ruled from New Delhi alone?

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8 Million Tonne Procurement Is Minimum—D.R. GADGIL

THE FOOD DEBATE

Question : Estimates of production made by different people vary—well, some mention 90 million tonnes, others 95 and yet others 100 million tonnes. The difference between 90 and 100 million tonnes is 10 million tonnes which is roughly the order of shortfall in a bad year and correspondingly the order of imports.

Professor Gadgil : All the later estimates vary between 92 and 95 million tonnes, which is not too large a margin. However, I should warn you in this regard that this estimate contains not only the Kharif crop for which the data are more reliable but also the Rabi crop in relation to which, naturally, there is a great deal of guessing at this stage.

Question : There was a suggestion made by the Food and Agriculture Ministry about the widening of the base of the National Sample Survey.

Prof. Gadgil : I am afraid merely broadening the base of the National Sample Survey would not be sufficient, because you have in this matter to take a large number of crops, not only the main cereal crops. Besides, remember, you have to bring into picture the States, their Bureaus and their Agricultural Departments. The present position appears to be this. As a result of the Foodgrains Policy Committee's recommendations, the Food Ministry tried last year to prepare a draft kind of budget. But it found that it would be best not to proceed with the preparation of a budget like this unless there was a very general agreement regarding the

“A minimum figure for distribution is 11 million tonnes... Last year, we had an internal procurement of the order of 4 million tonnes and something of the order of 8 to 9 million tonnes came in through imports. Now if you say that no more than 3 million tonnes would be available from imports, there will be 8 to 8½ million tonnes to be procured both for internal distribution by States and for supply to deficit States. That is why the Planning Commission took the view that the 8 million tonnes mentioned by the Agricultural Prices Commission was a minimum target of internal procurement.”

Professor Gadgil set out his ideas on food policy in an interview with a panel of newsmen—Mr. Vishnu Dutt, Mr. Dilip Mukerjee and Mr. Venkatasubbiah. Here we publish excerpts from the interview which was broadcast by All India Radio.

machinery for collecting the information and there was some agreement regarding the quanta of the components that come into the budget. Therefore, with the pressure on the Ministry, the whole proposal got postponed. We have, as a matter of fact, asked the personnel of the Planning Commission this year to come in and help the Ministry if it sets up an organisation or undertakes any studies in this field.

Question : What are the different quanta to which you referred just now?

Consumption Levels

Prof. Gadgil : There is one important quantum, for example. It is the consumption of cereals on an average per capita in a State. As we know, the consumption differs rather widely from State to State. At the same time, when you are preparing what are minimal budgets, it becomes awkward for any State to accept that it has necessarily a much lower consumption per capita than other States; or even if it accepts that, it may not accept that in the budget its quantum should be so restricted.

Question : You mentioned earlier that about 92 to 95 million tonnes will probably be a more realistic estimate of what the foodgrains production is going to be. Well, on this basis, what would be the gap, taking into consideration the probable consumption?

Distribution Needs

Prof. Gadgil : I prefer not to operate with overall production figures because you have the problem of estimating what the marketable surpluses would be. And that is always a rather doubtful proposition. I would, therefore, prefer to operate with figures such as those of distribution through fair price shops. During the current year, such distribution is likely to add up to 13 or 13.5 million tonnes. Now if you allow for some specially large measure of distribution because of the drought conditions in States like Bihar, a minimum distribution figure would be of the order of 11 million tonnes. It is this 11 million tonnes that you are really thinking of getting for distribution. This 11 million tonnes, of course, includes distribution in all the States together, so that procurement is for internal distri-

bution as well as for supply to the Centre, or distribution to the deficit States. Now if you look at last year's figures, we had an internal procurement of the order of 4 million tonnes and something of the order of 8 to 9 million tonnes came in through imports. If you say that no more than 3 million tonnes would be from imports, there will be 8 to 8½ million tonnes to be procured both for internal distribution by States and for supply to the deficit States. That is why the Planning Commission took the view that the 8 million tonnes mentioned by the Agricultural Prices Commission was a minimum target of internal procurement.

Question : What are the prospects of our being able to get hold of the 8 million tonnes? I ask this because there is a great deal of scepticism among people from what transpired at the Chief Ministers' Conference and afterwards. For example, the target of 8 million tonnes was not accepted by the Chief Ministers. Then there is the price question which is an important factor.

Prof. Gadgil : Well, the two are very much linked together in one sense; and they are not really linked together in another sense. The price demands of Chief Ministers are linked with procurement so that they may go back to their States

gest surplus in rice. The demand for higher price made by the Andhra Pradesh Chief Minister has really been substantially agreed to. So the question now is what efforts Andhra Pradesh would make. Would it make the fullest effort to reach the target set for it by the Agricultural Prices Commission? The Andhra Pradesh Chief Minister seems to think that the target has been put too high. I personally believe that this is a matter in which a judgment cannot very well be made.

I am rather relying much more on the efficiency of the purchase arrangements during the first three months of the procurement season and the attitude of the Governments in States towards allowing freely purchase arrangements and to enabling the Food Corporation of India to work within their States. If the hopes that are now held of a much larger crop come true, a large volume of paddy and other Kharif grains should come into the market during the next few months. With the fair prices that are being offered, large purchases can freely be made either by the State Governments, or by an agency like the Food Corporation of India. In Madras not only are the prospects known to be good but the State Government accepts that they are good and fully co-operates in the procurement effort for making

"I do look forward to an early abolition of the zonal arrangement. But that will be only when the buffer stock rises to a substantial size...and when arrangements for internal procurement and the operation of the Food Corporation of India are so well established on the ground that, even with freedom of trading, we will not be led by private trade into a difficult situation."

is considerable danger of prices crashing, prices falling below the levels that have been discussed for procurement. In that event, open market purchases should be easy to make.

Prof. Gadgil : Yes, that is the view that I have publicly expressed. I have not used the word "crash". But I have said that, with a large volume of supplies coming into the market within a few weeks after harvest, there will be a tendency of prices to sag. At such a time a Government agency should be there to offer standard incentive prices to the producers all the time. That is what I meant when I referred to the efficiency of purchase arrangements. If they are well spread out and if the cultivator knows that he will get the full price in cash within a few days, I think, the response will be good. I would really count more on this response, because of the efficiency of arrangements, than on anything else.

Question : Do you think that if an adequate quantity is procured by the States both for their internal use and on behalf of the Central Government, the present zonal arrangements can be relaxed?

Prof. Gadgil : Now, I would not go so far as that. In the first instance, we must realise that today most of the surplus States and a large number of deficit States believe that for properly implementing the procurement and distribution policies that they have evolved

Crux Of The Question Is Efficiency Of Purchase Arrangements, Not Prices

and urge that the strongest effort at procurement should be made because the Centre has agreed to their demands. But in actual terms of sales by the farmer, I don't believe that the higher prices—much higher prices—demanded by the Chief Ministers are necessarily relevant.

Question : There does not seem to be much prospect of the States accepting even the higher prices.

Prof. Gadgil : A better way of dealing with this is to go State by State. Andhra Pradesh is our largest surplus State—with the lar-

available to Kerala as much of the *Kuruvai* crop as possible. I think this is really a question not of prices but of the co-operative attitude of the State Governments and of the efficiency of the purchase arrangements—purchase arrangements even at relatively small centres—that the Food Corporation or other agencies are able to make.

Question : A crop of 95 million tonnes would be an increase of 19 million tonnes over 76 million tonnes last year. With such a large increase one would think that there

during the last two or three years, it is necessary to have full powers of restricting movement. I do look forward to an early abolition of the zonal arrangement but that will be only when the buffer stock rises to a really substantial size—something of the order of seven, eight or nine million tonnes—and when arrangements for internal procurement and the operations of the Food Corporation of India are so well established on the ground that, even with freedom of trading, we will not be led by the private trade into a difficult situation.

Question : The Planning Commission stands for scientific planning of our resources and their rational use. What in effect we are now attempting or not attempting is that we are leaving things to the law of the market. It may turn out all right but we may marginally go wrong and the criticism of the lay man would be that we are not really planning anything. If we are planning, we are not implementing it.

Prof. Gadgil : Well, I don't think my view can be interpreted as *laissez faire*. What I stress is that the price offered to the producer should be an incentive price right from the start and should be maintained throughout the year. The second thing I have stressed is that there should be efficient purchase arrangement on behalf of Governments—Central and State—which are so widespread that almost any producer, small or large, who wants to sell his marketable surplus within a few weeks of the harvesting can get the fair, standard price. Now these are arrangements which are different from *laissez faire*.

One expects—and it always happens when there is a very large volume in the market immediately after harvesting—prices to sag. The experience of the small farmer is that he gets a rather low price. I am assuring against that. What I have not been counting on is the

very active co-operation of every State Government. And I am not counting on that because it is a matter in which there is a larger measure of uncertainty than in other things that one can assure such as the efficient operations of the Food Corporation.

Question : There has been much dissatisfaction expressed by some of the surplus States at the level of prices suggested by the Agricultural Prices Commission. They say that with the sharp increase in the cost of inputs over the last 12 months, the incentive element of the price has ceased to exist or has been greatly reduced. This may lead to fall in production next year. There is also the problem of relative prices which may lead to diversion of land from the less profitable to the more profitable crops.

Prof. Gadgil : I am afraid there has been a great deal of misunderstanding and some misinformation about this. As far as the surplus States go, it is not generally realised that the prices now offered are a little higher than the market prices prevailing during the monsoon months of 1967.

I have had full statistics compiled. Actually the logic of the State zones is that in the deficit States, the level of prices rules higher than in the surplus States because the surplus States, by their own action, impound the surplus within their border. The present attempt has been to bring about a parity between the surplus and the deficit States. Somewhat higher than market prices have been given to the surplus States and somewhat lower than market prices have been given to the deficit States. This in itself will enable us to move towards the abolition of the zonal system in the next step. This, I think, should be well realised. Therefore, I do not think that so far as the farmer is concerned there is immediately any ground for complaint or lack of incentive. If he was

producing last year at lower market and procurement prices, I do not see why he should not continue to produce at least as much with the prices that are now being offered.

Question : Can you say something on cash crops ?

Prof. Gadgil : What has been happening during the last two years is that the bad season has affected the production of foodgrains as well as commercial crops. There may have been some diversion from one crop to another but I don't think this is large. The general level has gone down. With a good year if the cereal production rises, there is no reason why production of cash crops—cotton, oil seeds etc.—should also not rise. As a matter of fact reports are that the oil seeds crop is expected to be much better. Regarding industrial production, the point we should remember is that the so-called recession in relation to our agriculture-based industries has not been a demand recession but a supply recession. Textiles have fallen or the oil seeds industry has suffered because there has not been a sufficient supply of raw material from within the country and even some imports have had to be made. With the larger production quite obviously this problem will not be faced this year.

Question : During last year and before, certain inputs had been sanctioned outside the Plan like minor irrigation, land development and so on. Is that likely to be continued in the interests of stepping up production ?

Prof. Gadgil : Quite obviously, the answer really is in terms of financial resources. So far as I can see, the general policy of encouraging everything towards increasing agricultural production still remains. To the extent that financial resources permit, it will certainly be followed.

ZONES CAN GO ONLY WHEN WE HAVE A SUBSTANTIAL BUFFER

FACTS THAT CANNOT BE WISHED AWAY

"In a federal structure like ours and with the primary responsibility in the matter of food production, procurement and distribution vesting in the federating States, the Centre can only work on a mutually agreed general approach to the problem and cannot lay down a rigid law which, however sound in principle, is difficult of being enforced".

A.L. DIAS

WITH two years of drought behind and an all-time record crop of 95 million tonnes ahead, a case could be made out for freeing the food economy from controls and restrictions which have served the nation well in years of scarcity. This temptation has, however, to be overcome. The hard facts of the food problem today make it imperative that full advantage should be taken of the bumper crop to secure stability in a vital sector of the national economy.

It would be fair to assume that with a pipeline completely dry there would be a certain amount of stock building by the farmers and the private trade and, therefore, the most vigorous efforts will be needed to secure enough grain for the public distribution system. Imports are becoming difficult to arrange not only because of dwindling world surpluses but also because the terms of food aid are becoming onerous and beyond the capacity of the national exchequer to bear. Wide fluctuations in food output in recent years have made it imperative that a buffer stock should be raised "as pivot of a policy of price

stabilisation consistent with overall social goals" and to ensure that the country takes a further step in the direction of self-reliance.

Given these circumstances, the basic assumption in the formulation of a national food policy would be that the continuance of an effective system of distribution of foodgrains is necessary for holding the priceline. Apart from meeting the needs of the traditionally deficit States, the requirements of the vulnerable groups, particularly during the lean season, have to be taken care of. It has, however, to be recognised that much of the support for the public distribution system will have to come from internal procurement and that central distribution of imported grains will have to undergo drastic reduction. With highly encouraging reports about Kharif crops, the primary charge on the State Governments would be to go in for a much higher order of procurement than what has been possible hitherto. If 4.3 million tonnes were procured in a difficult production year like 1965-66, it should not be beyond the capacity of the State Governments to reach the 8 million tonne target that has

been suggested for internal procurement this year. While there can be scope for difference of opinion as to how this 8 million target has to be equitably distributed as between the surplus and deficit States, the overall objective of reaching the target should be kept firmly in mind and both deficit and surplus States will have to gear up their procurement machinery for mopping up available supplies. The pressure on the procurement organisation will necessarily have to be great during the immediate post-harvest period and for this purpose a country-wide network of purchasing points will have to be set in motion.

A departure will have to be made from the present pattern of procurement which has largely relied on procurement of rice. There is considerable validity in the argument that the procurement achieved in respect of the principal cereals and coarse grains hitherto has not been proportionate to the production and a disproportionate dependence on imported wheat and milo has come into being. These disparities can and should be eliminated in view of the fact that the performance of the high-yielding varieties of wheat and hybrid millets in the last season has been more than encouraging.

A second aspect of procurement policy which has been the subject of considerable national debate is in regard to the necessity for a producers' levy. There is merit in the Agricultural Prices Commission's observation that there should be a

Buffer Stock Pivot of Price Stabilisation

Mr. A.L. Dias is Secretary, Department of Food, Government of India.

Purchasing Network for Procurement

social obligation on the part of the cultivator to surrender a portion of his produce to the State in the wider national interest. It would, however, be prudent to reckon with the fact that the administrative implications of collection of a levy from every producing farmer in this country may be beyond reach in the immediate future. The consensus that developed at the last Chief Ministers' Conference that the modus operandi of procurement should be a combination of one or more of the existing means of procurement was, therefore, not only practical but sensible. It is also unrealistic in the present context of things to lay down a uniform pattern of procurement operations throughout the country so long as it is ensured that the target set for the contribution of each State to the national pool is attained. Some have chosen to see in this decision the inability of the Centre to enforce national discipline in the matter of food policy. They, however, tend to forget that in a federal structure like ours and with the primary responsibility in the matter of food production, procurement and distribution vesting in the federating States, the Centre can only work on a mutually agreed general approach to the problem and cannot lay down a rigid law which, however sound in principle, is difficult of being enforced.

The subject of procurement price policy has also been the subject of keen controversy. There is little doubt that a positive policy of incentive price to the farmers, which has been in vogue during the last few years, has been a major factor in furthering programmes of agricultural production. The introduction of the High-Yielding Varieties Programme involving the use of expensive inputs has certainly raised the cost of production. The general cost of living of even the farming community has registered a rise. National interests also demand that the pace of progress in production efforts should be kept up and any

"The consensus that developed at the Chief Ministers' conference that the modus operandi of procurement should be a combination of one or more of the existing means of procurement was not only practical but sensible".

"The cumulative effect of the various factors at work would indicate that procurement prices would have to strike a balance between the interests of the producers and the interests of the consumers".

"Zonal restrictions are only temporary expedients which stand justified because of the responsibility of containing the food problem as quickly as possible. The Centre favours the gradual removal of zonal restrictions. The timing of this relaxation, however, is important".

factors at work would indicate that procurement prices would have to strike a balance between the interests of the producers and the interests of the consumers. This is precisely what has been attempted in the Government's announcement of the Kharif procurement prices ranging between Rs. 45 and Rs. 56.25 per quintal of paddy and Rs. 43 and Rs. 55 per quintal of coarse grains. These prices also represent an attempt at evening out wide disparity in inter-State prices.

The retention of the single State Zone System follows as a logical corollary to what has been stated earlier. While there can be no dispute about the fact that the working of the System has been vitiated to some extent by unhealthy social practices, there is considerable validity in the argument that the higher order of procurement prescribed for this year is possible of achievement only if the inter-State movement of foodgrains is not immediately thrown open to the free play of the market mechanism. Such controls as this Single State Zone System implies are also necessary for the State Governments to maintain control over distribution and prices throughout the country. However, it is true that the zonal restrictions are only temporary expedients which stand justified because of the responsibility of containing the food problem as quickly as possible. The Centre is not committed to the system of controls on ideological or

Administrative Implications of Levy Can't Be Ignored

diminution of incentives in this context would have a retarding effect. Countervailing these arguments is the point of view that the stability of the cost of living should be maintained and the opportunity of an expected good crop should not be lost sight of for controlling inflationary trends in the national economy. Moreover, in view of the very much higher production expected this year, levels of procurement prices should be reasonable and demands for significant enhancement should not be entertained. The cumulative effect of the various

other grounds and favours the gradual removal of the zonal restrictions either by forming larger zones or by removing zonal restrictions altogether. The timing of this relaxation, however, is important. The appropriate time for a review of the policy of controls and restrictions on movement of foodgrains would be when we have been able to lay by a sizable buffer stock to meet emergent situations, when the foodgrain prices show a declining trend and there is reasonable prospect that the coming crop would be a normal one.

PRODUCTION, PROCUREMENT, PRICES

What The States Think

ANDHRA

It is good that, generally speaking, all the country over, the monsoons have been favourable and it becomes necessary that we should maximise our procurement in all the States surplus and deficit. It should not lead us into any complacent mood. But the long-range problem will be better production and the Central Government will have to go in a big way to help the States in achieving this in the succeeding years so that we can completely do away with imports from abroad.

In procurement, different States have different experiences and so far as my State is concerned, we are trying to buy in the open market immediately after the harvest a fairly sizable amount and then we are going to have a levy on the miller—a 100% levy on the miller—and thirdly also we want to have a levy on the fairly prosperous producers. This three-pronged attack will put us in a comfortable position and enable us to help the Central Government so that it can look after the deficit States.

Mr. Brahmananda Reddy

KERALA

From the long range point of view, production is the most important thing but it is very necessary that we end our dependence on imports as quickly as possible. In the matter of increasing production the aspect of land reforms, the incentive to the tenant cultiva-

tor, the incentive to the poor peasant and the agricultural labourer is as important as the supply of proper inputs to the big farmers. As for procurement I am of the view that it should be so intensified that the entire balance from the big farmer is mopped up.

Mr. Namboodiripad

MAHARASHTRA

I will go a little further than levy because levy does not tap all the agriculturists. There are small holders who sell in the market. Generally the grain is purchased by the traders and hoarded. So, we have a system of monopoly procurement. Whosoever sells must come to our agency. Then we also have a graded levy for the agriculturists who have larger holdings and that is how in Maharashtra we have eliminated the traders and I think, this system is working very well.

It is for each State to adopt whatever system it wants but it must be recognised that we must do our best in procurement. Otherwise, even if you become surplus, in effect many parts of the country will remain deficit. Our agricultural population is so large, that even if each family keeps two quintals more than its requirements, the quantity will run into lakhs and lakhs of tonnes. So, we will have to be very particular about procurement. I think this is as important as the production itself.

In Maharashtra the farmers are allowed to sell small quantities—20 kilos or 25 kilos. The labourers or the artisans

go to the agriculturists for small purchases, one or two kilos a day. This normal transaction is not actually trade. If this is not allowed Government will have to feed everybody.

Mr. V.P. Naik

PUNJAB

As far as my State goes, it is wholly unnecessary to bring in levy because in imposing levy you have to employ a huge machinery and employ petty revenue officers. This might even lead to corruption. I prefer the share system in the market and pre-emptive right of the Government to bid. It brings in competition between traders and the Government and stabilises prices. We have a very good system of regulated market. We will be able to procure as much as we are committed to. I would like to help the country as much as possible.

Mr. Gurnam Singh

MADRAS

I would ask the farmers not to insist on enhanced procurement prices for paddy at the moment. Enhanced procurement prices and rupee-a-measure rice cannot go together. If the price is to be increased then there is no escape from new taxes.

Incentives do not necessarily mean rupees and paise. Incentives by kind would go a long way in offsetting the increased cost of cultivation. Also, increased yield, as a result of modern agricultural methods, would amply compensate the extra money spent on cultivation.

—Mr. C.N. Annadurai

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INTO 1968 WITHOUT FOOD POLICY

AFTER two years of drought India had an unusually kind monsoon this year. Thanks primarily to this, the country is going to harvest a very good Kharif crop in the next few months. How big the crop is will not be precisely known—precisely, that is, to the extent official food statistics are anything more than fancies—until early next year.

The Food and Agriculture Ministry hopes that the crop may be of the order of 95 million tonnes, if not larger. If this hope materialises, the country will have six million tonnes more than the previous record production of 89 million tonnes in 1964-65. But we will still be short of the Third Plan target by five million tonnes. The Agricultural Prices Commission has proceeded very cautiously and recommended procurement prices and targets on the basis of a yield of only 90 million tonnes.

The Government is full of optimism and is trying to radiate it all around. Poverty-stricken and half-starved millions need solace and, abroad, our western aid-givers have to be assured that India is still a going concern before they can be persuaded to loosen their purse-strings for our development plans. That possibly explains why in far-away Ottawa Mr. Dinesh Singh, the Commerce Minister, put the figure of the estimated crop this year at 100 million tonnes and reiterated that India would achieve self-sufficiency in food by 1970.

It is being propagated that better days are ahead and that this year's spurt in agricultural production will help restore vitality to the sluggish industrial sector and gene-

RANAJIT ROY

rally lead to a recovery of the economy which has been sagging since the Chinese attack of 1962. There is even talk of a possible slump in farm prices. Some have started advocating adoption of the so-called "Kidwai policy" which, in plain words, is a policy of free trade. We have obviously not learnt our lesson.

Where Hope Springs From

The Government's optimism, which must be assumed to be genuine and not a pose, is based

Good Crop Alone Is Not Enough

almost solely on the expected size of the coming harvest. Similar optimism was there also at the end of 1964, but to the great astonishment of the Government things went totally wrong. American help had to be sought more urgently than at any time before. Imports of food in 1965 totalled 6.7 million tonnes, a record up to that time. Much of it came, of course, under American Public Law 480. The pipeline that year was not as dry as today. The bumper crop of 1964-65 came after two almost normal years when we had gathered 78.5 million tonnes and 80 million tonnes respectively, whereas in 1965-66 and 1966-67 we harvested no more

than 72 million tonnes and 75 million tonnes.

Ignoring the quantity that was in the pipeline, the availability of foodgrains in 1965 was no less than 95 million tonnes and the population then was about 20 million smaller. It so happened that the wholesale price index for foodgrains, which stood at 119.6 in January 1964 (1952-53=100), jumped to 151.3 by January 1965. This was the biggest increase in any year since 1950. Prices have since skyrocketed to 226.8 for cereals and 309.4 for pulses (September 30, 1967).

It pains one to record the brutal fact that even twenty years after independence vast multitudes in a

population that exceeds 500 million live on or below subsistence level. Everybody speaks of runaway inflation which has been caused, let us be frank about it, mainly by the heavy diversion of resources from Development to Defence. Defence now costs something like Rs. 1,000 crore a year compared to about Rs. 300 crore at the time of the Chinese invasion, but there has been no corresponding increase in the national product. Serious inroads are being made into the standard of living of all but a limited section at the top and more multitudes are joining the ranks of the half-starved.

Buffer Stocks

In such a country, having a good crop by our standards is not

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enough. In any case, the net availability of foodgrains in 1968 may not be very much more than in 1965—ninety five million tonnes. As the Agricultural Prices Commission has pointed out, the possibility of getting supplies from abroad has diminished and imports cannot take place in 1968 on the scale of 1966 (10.4 million tonnes) or of the current year (9 million tonnes). Moreover, the Commission has raked up that old and oft-repeated but never-implemented proposal to have a buffer stock. It suggests that a beginning be made this year with two or three million tonnes, and has spoken of the "social imperative of cutting down the imports of foodgrains." Since 1960 when Mr. S.K. Patil, as Food Minister, negotiated the massive PL-480 supplies, our imports have gone on increasing but a buffer stock has always eluded us. If Mr. Jagjivan Ram is able to start it, he will have done something remarkable.

Equitable distribution of internally produced and imported food

established liaison with bigger producers and both have come to have a tremendous political pull. Apart from industrial and trading classes, richer sections of the peasantry have profited most from the three Plans, but the land revenue they pay is the same as decades ago. Those who, a few years back, lamented that the peasantry suffered for lack of a political lobby need do so no more.

At the AICC Session in Jaipur in November 1963, Mr. Biju Patnaik warned the Congress that black money was running a "parallel Government". Estimates of the size of this money vary from Rs. 300 crore to Rs. 3,000 crore. Whatever its size—it is becoming larger day by day—black money is playing havoc with our economic life. The disease is dangerous and calls for drastic surgery.

When he was Finance Minister, Mr. T.T. Krishnamachari used to say that in this country normal economic laws did not operate;

recent Chief Ministers' Conference on food to clinch the issue.

Differences are so wide that virtue has been found in escapism. Every State has been left free to decide its own targets of production and procurement and methods of procurement. No firm assurance is available that the States would make earnest efforts to procure a total of 8 million tonnes next year. There is no agreement on prices among the States. What is more significant, the Agricultural Prices Commission and the Planning Commission, the Union Government's principal advisers on food, have different ideas about the price or prices to be offered to the producer. As for a national food budget, everybody seems to be trying to forget it. To sum up, India will enter 1968 without a food policy.

Procurement prices were fairly high during the last crop season. The Prices Commission suggested moderate increases for the coming season, but, under pressure from

Government has a duty by the People

has to be ensured at prices reasonable for both the producer and the consumer. As long as the inflationary pressure persists—despite Mr. Morarji Desai's announced intention to halve it, the pressure is likely to persist for a pretty long time yet—it must continue to be the Government's responsibility to arrange for equitable distribution.

This presupposes formulation and enforcement of a precise food policy. Sixteen years ago, the First Five Year Plan postulated the need for a "well-defined food policy". We are still groping for it, countless conferences and reports by expert bodies notwithstanding. The basic question is how the marketable surplus of the food produced can be prevented from going into the black market. The problem remains since the Bengal Famine of 1943 when the black market was perfected as an art at the cost of some three million lives.

Today, the problem has become more intractable. Traders have

what prevailed was "jungle law." He was exasperated by the behaviour of the foodgrains market in the bumper year, 1964-65. There have been suggestions for monopoly State trading in foodgrains on several occasions, but the Government is still nowhere near it. Food supplies and prices are, indeed, controlled by highly organised black market operators who nowadays corner the grain before it comes to the market.

Chief Ministers' Failure

Formulating an all-India policy was at any time difficult in a country like ours. Each State, even when the Congress was in power everywhere, thought of its own interests first and of other parts of the country afterwards. Today, in the vastly more complex political map resulting from the fourth general election, authority faces an almost impossible task. There should be regret but not surprise over the failure of the

the States, the Union Government has announced a further pushing up of these prices. After this, there can scarcely be any possibility of the Government being able to hold the price line next year.

Producer Levy

What is being sought to be stressed here is that, even in the best of years, the country will be in deep waters so far as food is concerned, unless the Centre and the States combine to launch a determined attack on vested interests in both urban and rural areas. There is no sign yet that anything of this nature is contemplated. The Prices Commission has suggested procurement through levies on producers. If this is accepted, the middleman can be largely eliminated and the black market can be restricted. No firm commitment has been made on this point by the States.

No policy on food can be discussed in isolation from the agri-

culture policy and the state of land relations which, in a material way, determines production. The First Plan emphasised the need for land reforms in these stirring words: "The future of land ownership and cultivation constitutes perhaps the most fundamental issue in national development." In the fifties, the zamindari system or landlordism as introduced by Lord Cornwallis in 1793 was abolished. Laws were also enacted fixing ceiling for individual holdings, but their enforcement was at best desultory. All reform stopped short of making the tiller the owner without which land reform becomes a mockery.

The attitude the States had at least till before the last general

Where Capitalist

Japan can teach

Socialist India

election is typified by the remark a Patna official made to Mr. Wolf Ladejinsky, a Ford Foundation expert, who was making a survey of land relations on behalf of the Planning Commission in May 1963. Mr. Ladejinsky records that an officer "with whom we discussed the subject (land tenure) upon our return to Patna addressed us with a good deal of indignation in these words: 'What! Do you wish to upset our social order?' The vested interests in land are clearly highly entrenched and have protectors in top places.

Japan has no pretensions to having democratic socialism as its goal. But in that country no one can have a holding of more than seven and a half acres, and, as Mr. Morarji Desai discovered to his amazement during his recent visit to Tokyo, the food trade is a monopoly of the State there. Despite the flag of the socialist pettern we fly, we should take a lesson from the unashamedly capitalist Japan in this vital field.

REAPING A GOOD HARVEST

Prices Commission Looks Ahead

SOCIAL IMPERATIVE

An output of 90 million tonnes this year would imply an increase of 15 million tonnes over the preceding year. The stresses to which the economy has been subject during the last two years should be significantly lessened once an increase of this magnitude is realised. The crucial issue, however, is the reduction in the dependence on imported foodgrains which the larger internal availability should make possible. In the calendar year 1966, the total volume of imported grains was around 10.4 million tonnes. Even during 1967, food imports, according to present indications, are likely to be roughly 9 million tonnes. The overriding objective of food policy should be to eliminate this dependence as early as possible. Apart from the political uncertainties attendant on such external dependence, the possibility itself of obtaining foodgrains from abroad is sharply diminishing. In the course of the last three years, the stockpile of wheat in the United States, the largest supplier, has been eroded from a level of more than 30 million tonnes to 16 million tonnes. Even for the import of rice, the prospects are difficult. With the expansion of the war in Vietnam, the U.S. Administration has emerged as a heavy buyer of the grain in such markets as Burma and Thailand. It cannot also be ignored that, since 1963, the international price of rice has increased markedly.

There should thus be no controversy over the social imperative of cutting down the imports of foodgrains. The order of emphasis as between imported and internally-procured cereals needs to be reversed. It is imports which, from now on should be considered as a marginal category.

LET'S MAKE A START

Given the prospects of a good crop, a beginning must also be made this year to build a buffer stock of foodgrains in the public sector. Having regard to the wide fluctuations in foodgrains output witnessed in recent years, such a buffer would be the pivot of a policy of price stabilisation consistent with overall social goals. It would further ensure that the country does not relapse into increased dependence on imports in the coming years. Initially the size of the buffer cannot, of

course, be very large, but the Commission would certainly suggest that 2 to 3 million tonnes of foodgrains be set apart for this purpose during the year.

TIME FOR NATIONAL EFFORT

In view of the likelihood of a good crop, and particularly of a substantial yield for the first time from the high-yielding varieties and hybrids, it should be possible this year to improve upon the record of procurement all round. While the procurement of rice should be raised further, there should be at the same time an intensification of procurement of the coarse grains (and of rabi cereals too). An improvement in the rate of procurement of coarse grains (and rabi cereals) would, in fact, facilitate additional procurement of rice.....

Barring one or two individual States, this would be the first occasion for launching a national procurement effort for jowar and the other coarse grains. Such an effort is necessary from several points of view. In the course of the last seven or eight years, a considerable substitution has taken place in the consumption pattern of large sections of the population. These substitutions have been mostly unidirectional, namely, switching over from millets to imported wheat made available at prices lower than those obtaining in the market for the coarse grains. A gradual reversal of this process should be encouraged by increasing the proportion of coarse grains distributed through the ration shops and the fair price shops. This would make a significant contribution towards reducing the country's dependence on imports. One way in which the consumption of coarse grains could be raised is by eliminating the subsidies that are still reflected in the issue prices of imported foodgrains, particularly wheat. The removal of these subsidies is all the more called for in view of the large financial resources required for the building of a buffer stock of 2 or 3 million tonnes. Enlarged procurement of coarse grains would call for an improvement in the quality of storage, because these foodgrains have relatively poor keeping quality.

—Extracts from the report of the Agricultural Prices Commission

We May Miss The Bus Again

AD HOCISM IN FOOD POLICY

PRIME Minister Indira Gandhi told the Chief Ministers last month: "I do not think one can overestimate the importance of solving our food problem. In my view, our honour is involved, our security is involved, the lives of our people are involved." Indeed, the key to economic recovery lies in the solution of the food problem. The rise in foodgrain prices has been the most important element stoking the fires of inflation. As is now recognised this inflation has thrown out of gear the entire development programme. It has dried up resources for development and has created industrial unrest and political instability in the country.

There is no denying the fact that the food problem is essentially a problem of shortages, supply lagging behind demand. But it would be a grave mistake to believe that this is a temporary problem caused by two successive droughts. Undoubtedly, droughts have accentuated the problem. Yet, as the Vankatappiah Committee emphasised, "it is best to be clear on the point that the problem of shortage is one which will be with us for a number of years."

The Committee, like many other economists, came to this conclusion on the basis of long-term projections of both supply and demand. It is hoped that there will be an appreciable increase in food production. But there will also be a substantial reduction in food imports, as a result of a deliberate and welcome policy of curtailing imports and a decline in exportable surpluses in the world market. Taking both the factors into account, demand is certain to grow faster than supply because of the increase in population, growing urbanisation (between 1951 and 1961, the population of 112 cities

in the country increased at the annual rate of 3.2 per cent) and the increase in incomes, both real and monetary.

The permanent nature of the shortage is highlighted by a recent official study. According to this study, even if the per capita availability of cereals at 1961-63 level is to be restored in the coming year, the total requirement of foodgrains

Story Of Wasted Opportunity

by

KEWAL VARMA

Special Correspondent, Financial Express.

(allowing for margins of wastage, animal feed and seeds) will be as high as 108 million tonnes as against the expected production of 95 million tonnes. Thus, there will be a 13-million-tonne shortage in a bumper year. And nobody can assert that the daily per capita availability of 15.2 ounces in the 1961-63 period was a luxury even for poor Indians.

Japan's Example

This prospect only underlines the fact that there can be no economic salvation for the country without prudent management of food resources. This implies a long-term food policy "for not less than five years, possibly ten" and the elimination of private trade at the wholesale level. The suggestion of

elimination of private trade is motivated not by ideological considerations but purely by pragmatism. In the event of shortages, the private trade can regulate supplies only through the mechanism of prices, which means by increasing prices. However, the State can not only regulate supplies but ensure their equitable distribution to a fair degree through rationing and other means. The fact that a known capitalist country like Japan has monopoly state trading in foodgrains confirms that this mode of trading in foodgrains facilitates the development and industrialisation of a country.

However, in spite of the repeated recommendations of the National Development Council, numerous expert committees and leading economists, no systematic beginning has yet been made of a long-term food policy. The NDC resolution on state trading remained a dead letter for years, till our smugness on the food front was shaken by the yawning gap between supplies and demand in 1964. But even after that, we have been living essentially from hand to mouth, or rather from ship to mouth. Ad hocism in food policy was sought to be explained by the most difficult situation created by crop failures.

Fortunately, things are different this year. God has not failed us. But policy-makers have. This is the tragic impression one gathers from last month's Chief Ministers' conference on food and subsequent developments. There were five major questions before the conference. These were: procurement prices, single-State zones, producer levy, quantum of procurement and imports.

As regards single State zones, Mr. Jagjivan Ram took the Chief Ministers by surprise by suggesting that the present zonal system should be done away with and a beginning in this direction could be made by enlarging the existing zones. In fact, earlier in a note, the Food Ministry gave an indication of its thinking to the State Governments. Interestingly, one of the major reasons against the present zones advanced by the Centre was that "smuggling has reached disturbing dimensions". However, if this was the consideration to scrap the zones it would amount to throwing the baby along with bath water.

Not that there is any special virtue in the single State zonal system. But it is an intermediary stage between State entry into the food-grains trade and monopoly state trading. It helps to bottle up the marketable surpluses, particularly in surplus States, and thus facilitates procurement. It also reduces the functions of private trade since all inter-State movements are undertaken on Government-to-Government basis. However, if the next step, that is, monopoly state trading, is not taken in time, the single-State system becomes irksome and pointless and, in course of time, would meet the same fate as prohibition. It would be observed in the breach.

Similarly, if the single-State system is not accompanied by a

The Centre was also indifferent to the suggestion of the Agricultural Prices Commission to make producer levy as the "principal instrument" of procurement in the current Kharif season. What is more surprising is that even Prof. D. R. Gadgil, Deputy Chairman of the Planning Commission, did not lend whole-hearted support to the suggestion of the Prices Commission. As the Prices Commission has said, the producer levy is the "most reliable system of procurement enabling the mopping up, at the very source, of a part of the produce which can be approximately estimated in advance. It minimises leakages; under any other alternative system, where procurement is attempted at a second or third order remote from the actual producers, there arises the danger of a wide diffusion in the procurable grain. The producer levy also ensures that the price offered by the State does, indeed, reach the producers, and is not inordinately eaten up by traders and other intermediaries."

The position of the Prices Commission is vindicated by the following report appearing in the Statesman (New Delhi) dated October 18: "What aggravates the fears of the farmers is the Madhya Pradesh Government's decision to confine the procurement of paddy to rice mills and big traders. The Government has said that it will fix a floor price for rice later this month. But

price, if there is levy on millers only. The production of these small hullers is roughly ten to fifteen per cent less than that of the large sized rice mills. Thus, it results in a national wastage of a most precious commodity.

Therefore, almost all the expert committees which have gone into this question have recommended producer levy. The Venkatappiah Committee, of which Prof. Gadgil was a member, also recommended that as "an important part of the national food policy, each State—surplus or deficit—should introduce a minimum graded levy on the producer in respect of all the major foodgrains."

Unfortunately, at the political plane, nobody comes forward to support producer levy. This perhaps testifies to the political influence of the large producers. However, unless steps are taken to curb the speculative and hoarding activities of the large producers, there will be no solution of the food problem. Producer levy is the neatest and the surest way of curbing these activities.

Procurement Price

Procurement price is one of the most ticklish issues facing the country. It is now conceded that one of the major reasons of stagnation in agriculture was the deteriorating terms of trade of agriculturists, brought about by massive imports under PL 480. For instance, during the ten years ended March 1963, rice prices rose by 11 per cent and wheat prices in fact declined by 14 per cent; prices of raw cotton increased by 18 per cent. As against this, during the same period prices of manufactures went up by some 30 per cent, intermediate products by 36 per cent and fuel by 38 per cent. But in the last four years partly as a result of Government's deliberate policy and partly because of the staggering gap between supply and demand the trend has been completely reversed. The terms of trade between cereals and manufactures have shifted in favour of the former by nearly 33 per cent.

The pendulum has now swung to the other extreme. The time has come to cry halt to further increases in farm prices. Already the procurement prices have tended to

WHY THIS SILENCE ON NATIONAL FOOD BUDGET ?

national food budget, it perpetuates inequalities and denies any opportunity of equitable distribution of surpluses or shortages. Unfortunately, nobody talked of the national food budget at the Conference. The suggestion for the national food budget was made exactly a year ago by the Venkatappiah Committee. But no serious action was taken on the recommendation. A half-hearted and abortive attempt to prepare the budget was made at the Chief Ministers' Conference in April last. Now, everybody seems to have forgotten it.

once the producer himself has been left to the tender mercies of the traders and millers, there is no guarantee that the floor price will, in fact, be paid. Until now the payment of floor price was assured because the procurement took place on the basis of monopoly purchase by the Government."

When the differential between the procurement price and the open market price is wide enough, the large producers begin to set up one or two tonne rice hullers to escape selling rice at the procurement

degenerate into an inflationary spiral. It has set in motion a vicious circle where food prices are chasing the price of commercial crops and vice versa. The case in point is the prices of sugarcane which have been revised upward three times in the last three years. If the procurement prices of food-grains are increased appreciably from the level of last year, there will be no escape from the grip of this vicious circle.

But this is precisely what has happened after a good deal of haggling between the Centre and the States. The increase varies from 50 paise per quintal in the case of Andhra to Rs. 10.50 per quintal in the case of Punjab and Haryana. In terms of percentage, the maximum increase is 25.

Targets of Procurement

As regards total procurement, the most optimistic estimates place it at 6 million tonnes against the target of 7 million tonnes suggested by the Agricultural Prices Commission for the current *Kharif* crop. Even if this optimistic target is realised (if past experience is any guide, it will not be), it will still substantially fall short of requirement of the public distribution system. The Agricultural Prices Commission, in fact, underestimated the requirements since it based its calculation on the quota of six ounces per adult per day in the statutory rationing area. There is no justification to keep the people at this famine level ration when we are going to have a bumper crop. In all probability procurement of 6 million tonnes will prove to be inadequate to stabilise the food prices during the lean season next year.

Imports

As regards imports, one is rather intrigued by a report that the Food Ministry has asked the Finance Ministry to secure 8 million tonnes of concessional food imports next year. It is totally incompatible with the Government resolution to achieve food self-sufficiency by 1971. Moreover, we have no face to ask for massive import of 8 million tonnes with a bumper crop at home. A maximum food import of 4 to 5 million tonnes

would be justifiable in the present condition if we really mean business when we speak of food self-sufficiency.

Another shortcoming of the Chief Ministers' conference was that no thought was given to procuring and regulating the prices of at least a few popular varieties of pulses. Pulses occupy quite a heavy weightage in the cost of living index and their prices in the last one year have increased by over 80 per cent. Unfortunately the powers that be have decided to leave the consumer to the fate of market forces in respect of prices of pulses.

All this makes it obvious that the most favourable opportunity which has come after years of waiting to launch a well-conceived food policy has been lost. This is

WHAT NATIONAL INTEREST DEMANDS

A UNIFORM CODE

It should be a social obligation on the part of the cultivators to surrender a portion of the produce to the State in the wider national interest. In this context, just as in the case of direct taxes such as taxation of income and property, a uniform code is laid down for the whole country and for all citizens, so also should a system be evolved under which a part of the output of the agriculturist would be obtained for purposes of the State. The only difference here would be that while direct taxation involves no *quid pro quo* in the case of procurement, the transactions would still be in the nature of buying and selling and the producers would receive a price, even though this price may be lower than the prevailing open market price. The case for such an impost becomes particularly strong in view of the extremely light incidence of agricultural taxation in the country.....

In the matter of inputs, too, the Government, through its policies in regard to the supply of fertilisers, pesticides, improved seeds, extension facilities, and development of high-yielding varieties, have continued to subsidise agriculture. A comparison of the situation now with that of five years ago would show the vast difference in the supply of inputs. The producers are also being helped by the extremely low

tax burden on agriculture. That considerable incentives to increase production already exist is reflected in the demand for inputs which is far in excess of their supply. What is, therefore, called for now is an enlargement of the provision of inputs rather than a further increase in prices.

—Agricultural Prices Commission

PROGRESSIVE RISE IN PROCUREMENT

For attaining total self-sufficiency, the magnitude of domestic procurement needs to be such as would not only meet the requirements of public distribution but would also provide for the building of the buffer. A procurement of this order, however, may not be immediately feasible. The Commission is, nonetheless, of the view that, during the ensuing season, the objective should be to procure at least 8 million tonnes of cereals, as against the recent annual average of 4 million tonnes. In the subsequent years, the programme of procurement should be increasingly intensified. It should be the aim of policy to extend and strengthen the machinery of the entire country so as to enable the Central and State Governments together to effect a procurement of progressively higher order annually.

—Agricultural Prices Commission

primarily because of lack of firm leadership by the Centre at the conference. In fact, it has let the formulation of food policy go by default.

What is more disquieting is that even this weak policy is diluted and distorted further in the course of implementation. Reports coming from various States, particularly the surplus ones, indicate reluctance of the State Governments to fall in line with the Centre. The immediate post-harvest period is the most crucial for procurement. There is a race between the private trader and the Government agencies to corner as much stock as possible. The confusion and contradiction in certain surplus States may well prove to be costly bungling. At this rate, one fears that this year again we may miss the bus.

SAD, SWEET SONG

THE Great Bihar Tragedy—that is what it might have been, but for the great concert of humanity and effort which saved this populous State—it has almost fifty million people—from destitution. So much is heard of what Bihar went through (which was grim) but so little is said of what was done (which was mighty).

In sheer proportion, the problem thrown up by the catastrophe of one bad season after another was without precedent in the years since we emerged into freedom. Even in a normal year, Bihar needed some 13 lakh tonnes from outside to feed its people, over and above its harvest of some 73 lakh tonnes. And last year, fifty-five lakh tonnes of the crop was denied by the cruel drought. Thus the deficit swelled to 68 lakh tonnes. Finding this grain was not easy in a year of general shortages. And reaching it to the remote areas, quite often without even the rudimentary communication, was a task enough to baffle the best organising genius.

How then was the Great Tragedy averted? Without exaggeration, it can be said that it was the triumph of a will not to be defeated. Of that resoluteness, the people of Bihar gave enough evidence, and so did social organisations, national and international. New Delhi acted with a swiftness and imagination not usually associated with a machinery that has come to acquire a reputation for opaqueness. There was thus an all-round will to win and the battle was won, though the battle scars remain on the fields of Bihar and on the men, women and children who have survived the grim ordeal.

Remarkable Achievement

Was this not an achievement in which we can glory even as the collapse of Bihar's agriculture was

a failure of farm policy in which we had to sorrow? This was what, obviously, the Prime Minister meant when she said, "Unfortunately, when something was achieved in the midst of a crisis, people tended to minimise or even ignore it. What had been achieved in Bihar and other drought areas was remarkable. This achievement has been passed over as if nothing had happened."

Not only did Bihar emerge from a crisis reasonably fit, but it is doing everything to ensure that the crisis will not occur again. Bihar's problem was that of a total of 21 million acres of crop land, less than two million acres had assured irrigation. Bihar, certainly, does not have less than the average water availability in the country. Why then this parsimony in irrigation?

Canals and Tubewells

The answer lay in canals and tubewells. This long-neglected solution is now being attempted—and with fair prospects. In Gaya alone some 11,000 *ahars* etc. have been re-excavated bringing to six lakh acres of parched land a good chance of irrigation water. Diesel pumps are being installed and lift irrigation is being electrified. Completion of the canal schemes, now under way, will provide irrigation to one-fifth of the total sown area.

A 2,000 cusec by-pass was built in 1964 and another in May 1966 in the Eastern Kosi Canal. In a single year this brought an additional crop of 3.3 lakh tonnes worth Rs. 25 crore. The full capacity of 10,000 cusecs is yet to be realised. This will be a major breakthrough.

There has been a spurt of minor irrigation in the wake of the recent crisis. Between August 1966 and March 1967, over 15,000 wells



IGNORAMAN

Wants to Know

If

the United FRONTS

are beginning

to reveal their

Disunited REARS

were energised. A similar number will be energised in the next few months. During the entire period of the first three Plans, the number was only 18,000. Take tubewells. The number of wells drilled last year alone (1,200) was higher than in all the preceding 15 years.

Bihar's drought, it may be hoped, will soon be a memory. And in the sense that in its wake came the life giving waters, it may not be a wholly unhappy memory.

— R.K.

High Yielding

At a public meeting on family planning, a prominent leader of the locality, who was Chairman, remarked, "In these days of acute food scarcity we should concentrate our attention on limiting our families. But unfortunately I am unfit to preach family planning as I have ten children."

Suddenly, one among the audience shouted, "Well, let him talk on the High Yielding Varieties Programme then."

Jacob Samuel

THANJAVUR

NEVER HAD IT SO GOOD

A common pet expression of a Tamilian is "Thanjavur—rice bowl, the granary of Madras". He is very proud of his Kaveri—and he will say it is one of the best utilised rivers, as, indeed, it is—and of his Mettur Dam, the Grand Anicut and of his "*Pon Vilayum Bhoomi*", meaning "land where grows gold".

Yet till recently much of this generous soil yielded but one crop. Some years ago, Thanjavur was included in the package districts for intensive agricultural development. This was an area eminently suited for tapping sub soil water. Several schemes to bring out this water were quickly put through, so that two crops may be raised where only one grew before.

Thanjavur has always had a unique cropping pattern. The short term *kuruvai* crop is harvested in September–October, which is just when the north east monsoon arrives. Thus even in normal times the harvest had to be rushed to nearby districts for parboiling and milling. *Kuruvai* is sown in June–July on about 3 lakh acres.

Samba—a long term crop—is harvested in January–February, and though showing is done along with *Kuruvai*. *Samba* is raised on about 9 lakh acres.

After the *Kuruvai* harvest another crop is taken known as *thaladi*.

The advent of ADT-27—the new Indo Japonica Variety developed after years of research in the Aduthurai Research Farm in Madras State—has led to some crucial changes in this cropping pattern. ADT-27, under favourable condition, can yield an average of 4,000 pounds an acre—which is twice as much as the yield from the common varieties. It is also a short term crop which can be harvested in 105 to 110 days. It is not season-bound.

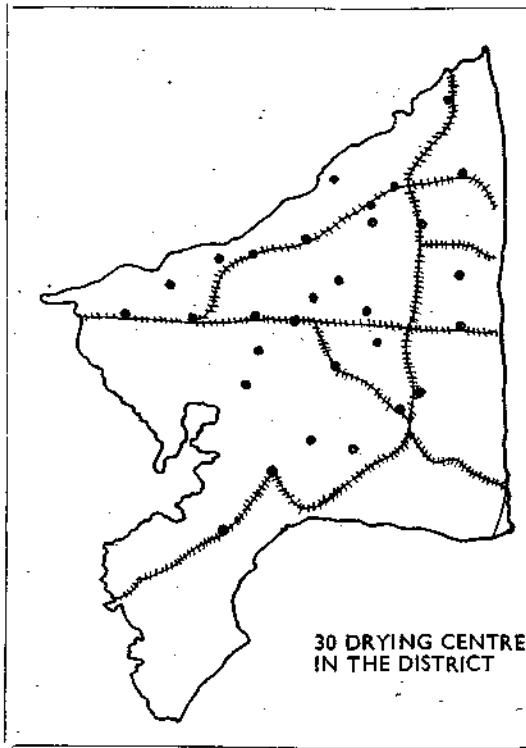
Last year, despite the late monsoon, the *kuruvai* was saved

because with the quick-yielding ADT-27, a November harvest was possible with transplantation in August. This was tried on two lakh acres and its success encouraged the State Agriculture Department to think in terms of converting a portion of the *samba* area for a short term crop and taking a second crop in the same area later. With this end in view, arrangements were made for seeds, fertilisers, pesticides and credit. The response from the farmers was good and ADT-27 has been sown, on a rough estimate, over three lakh acres as converted *samba* besides the three lakh acres under the traditional *kuruvai*.

Big Yield Increase

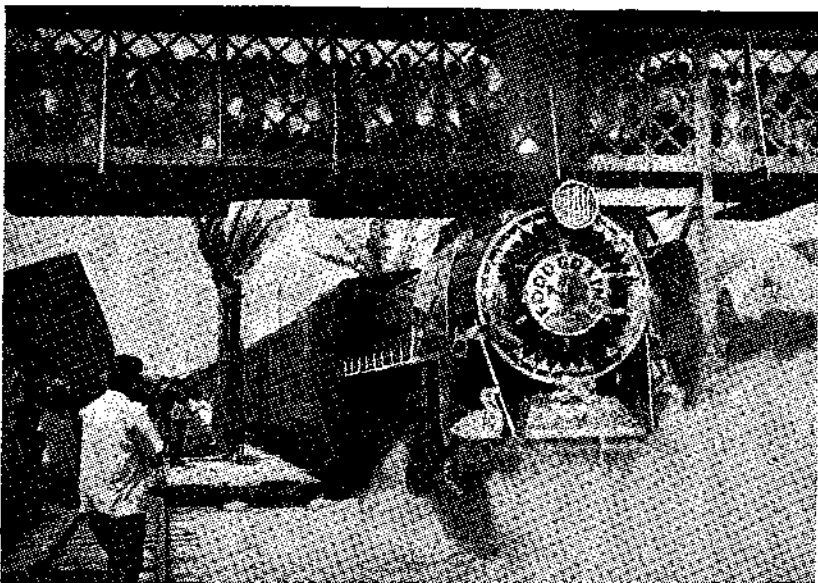
The normal yield in Thanjavur during October–December is between two and a half lakh and three lakh tonnes. At a conservative estimate, this year it will be five lakh tonnes and some venture to suggest that it may even go beyond seven lakh tonnes.

As has been seen, even in a normal year, the monsoon, coinciding with the harvest, used to create a drying problem. Now with this great increase in output brought about by the new technology, the

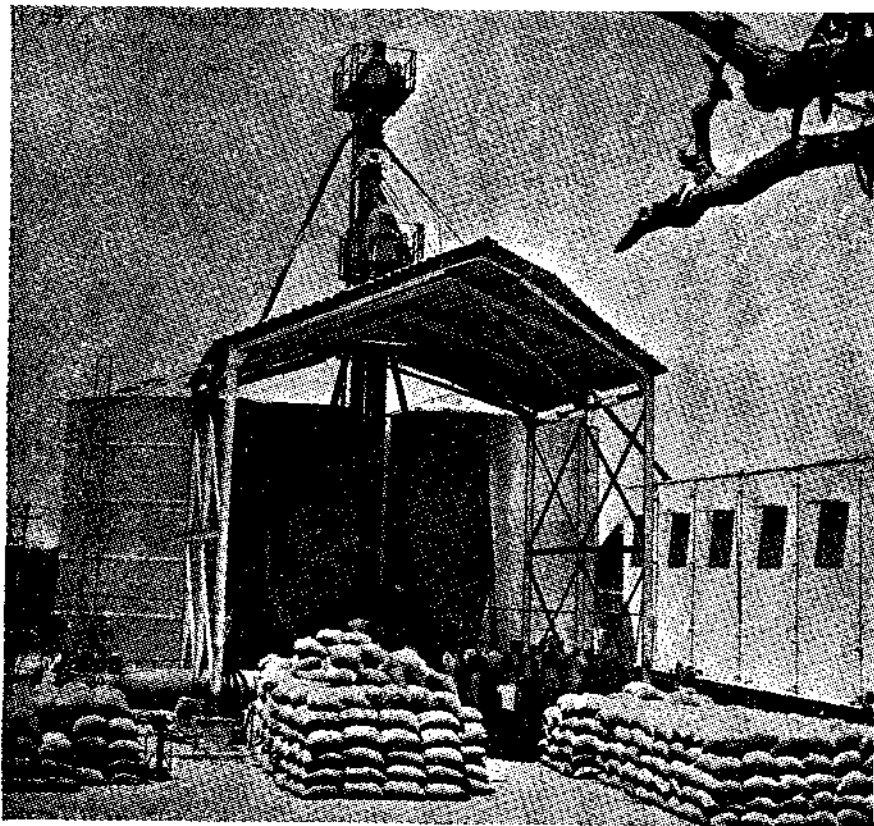


problem threatened to assume big proportions; particularly because ADT-27 germinates quickly.

It is to meet this challenge that the Food Corporation of India has set up 30 mechanical drying centres in Thanjavur district.



A 44-wagon special train, carrying ADT-27 rice, steaming out of Thanjavur station



Meeting the Challenge of Abundance

the sun, the grain is prey to the bird and the rodent. Further, there is "sun checking", whereby the "fracture points" in the kernel break during milling. And, there is always the threat of the paddy in the open being exposed to rain.

The loss from all these factors is often as high as fifteen per cent.

The "New" Scores over the "Old"

Here, at least, the "new" method wins hands down. With the advent of the mechanical dryer, there is no longer the need to keep the paddy waiting to be harvested. Neither sun nor rain, neither bird nor rodent, need come between man and his harvest. What he sows, he reaps, and what he reaps he earns in full measure. Nationally, there is at once a sizable addition to stocks with the same harvest.

Again, as has happened in Thanjavur, a sudden spurt in production, without a matching increase in milling capacity, puts the farmer in a dilemma. What should he do with the clouds hovering across the skies and his paddy threatening to "sprout"? Without the dryer, he might have been compelled to sell for whatever he could get quickly.

The Food Corporation has a duty to support the farmer, but it could not well have afforded to buy the paddy at a support price and lose in storing. Something had to be done and the dryer was the answer.

The FCI's thirty dryers installed in Thanjavur district will each have a capacity to dry 160 tonnes a day. This is just the beginning of the Corporation's programme to be prepared—not for shortage but for PLENTY.

DRYERS—FCI'S ANSWER TO PROBLEM OF PLENTY

MECCHANICAL dryers remove moisture from paddy by blowing heated air through a constantly moving mass of grain as it descends through large columnar vessels. Paddy is fed in at the top and flows through, its rate of descent being regulated mechanically.

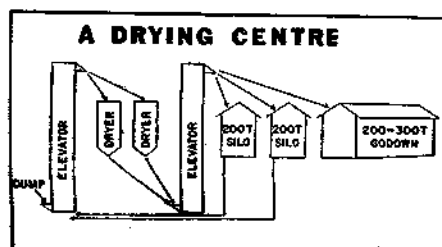
Air, which had been heated in a heat exchanger where oil is burnt, is sent in by blower fans and goes through paddy as it descends. The flow of air is at right angles to the flow of paddy.

The process is so contrived that a uniform moisture level is obtained in the paddy that is dried. This improves the quality of the grain for milling and storage. Moisture content is reduced from about 22-24 per cent to 14 per cent in three stages.

Tradition

The traditional drying is in two stages. First the harvest is put off so that paddy, after maturing, may shed some of its moisture. Then, after the staggered harvest, there is drying in the sun.

At both the stages, there is an inevitable loss. As paddy waits to be harvested, some loss cannot be avoided from shattering. Later, in



FAILURE NOW WILL BE MAN'S, NOT GOD'S

M. SUNDER RAJAN

News Editor, All India Radio.

DESPITE a bumper Kharif crop in the offing, the food problem remains. The main strategy of procuring seven million tonnes is in jeopardy. Hopes of building a buffer stock of two to three million tonnes have receded. The cause is man-made. The result can well be a hyper-inflation.

The basic issue is the procurement prices. The Centre has announced prices 20 to 30% higher than those recommended by the Agricultural Prices Commission. The Commission had built up a good case for pegging the prices at last year's level fixed at the end of two years of drought conditions. The Centre has, however, decided to raise the limit in the name of a compromise between the needs of the producers and those of the consumers. The higher prices announced by the Centre have not satisfied some states, some of whom are the major suppliers to the Central pool.

CHAIN REACTION

What would be the effect on the economy if the increase demanded is granted? First, even if the increase is only 25%, the issue price is bound to be very much more, as the subsidy on imported food will not be there next year. This will start a chain reaction of higher prices. It will, in short, amount to deficit financing to the tune of some hundreds of crores, which we

are all determined to avoid. Secondly, the States will have to subsidise the grain, now priced more, for the consumer. Who will bear the additional expenditure? The Centre would rightly refuse to countenance any such demand, since it was the States which had insisted on higher procurement prices. The result would be a further inroad into the already unsatisfactory coffers of the States, with all the lag in development it implies.

There are other sound reasons why a further increase should not have been granted. There is no guarantee that the higher price will be passed on to the small farmer. Except under monopoly purchase straight from the grower, the chances of the rural tycoons such as big millers and traders, eating

of windfall. Despite the increasing concentration of wealth in rural areas, little, if any, effort is made to disperse it or mop it off for the state. In the name of food self-sufficiency, some States have even withdrawn betterment levies in areas which benefit at the cost of so many others. The high-yielding varieties have begun to change the small-holders' position. Some of them do not cultivate even sugarcane, which has lost its sweetness of a high price for them. The ability to hoard has gone up. While it is a fact that the modern inputs in a farm cost a lot and the risk involved should be covered, there is no case for immunising the meagrely-taxed rural oligarchy—from larger social obligations. Indeed, the Vankatappiah Committee had suggested a minimum graded levy, which implies that some stocks could be procured below the market prices.

But what is the position today? Andhra Pradesh wants extra bonus for its supplies to the Central pool. Even deficit states like West Bengal and Kerala desire higher prices. Some States have not allowed the Food Corporation to function in the way it is supposed to operate.

RURAL OLIGARCHY SHOULD MEET SOCIAL OBLIGATIONS

away the public money, in the name of incentives to the farmer, are too real to be ignored. Nor can it be argued that higher prices are needed to prevent hoarders from cornering the stocks at a lower price. This cannot be true in a time of bumper harvests, and in the light of reasonably high prices already announced. Since the hoarder will not compete with higher offers, there is little reason to increase these prices.

WINDFALL

The *raison d'être* for another spurt is just not there in the rural areas. The favourable monsoon has played the crucial role and hence the profits have an element

Despite all this, the hope of building a buffer stock persists. But the suggestion of removing zonal restrictions on the movement of grain has cast a spell of gloom. The Chief Ministers are reported to have declined to hold themselves responsible for procurement if the single-State zones are altered. The rationale of the zones in a period of overall scarcity and in a country of uneven spread of effective demand was tragically illustrated in Haryana recently. The moment it was hinted that export of coarse grains might be allowed, the prices increased sharply, only to come down as quickly when such purpose was denied.

Once the zonal restrictions are honoured, the problem of procure-

ment is not one of feasibility or production but of willingness of the government in power and the efficiency of the administration. The bogey of the producers' honest sweat going down the drain no longer holds good. The Food Corporation, it must be remembered, is also an instrument for 'Operation Rescue'. In a closed market, a bumper harvest is bound to make the prices sag. But the support prices are there and it cannot be said that those who sell at that price will lose. The Corporation has entered the market in Punjab and Haryana to save the prices of coarse grains from being depressed. It has also been decided not to have two sets of procurement prices, one for the peak post-harvest period and another for the lean-days. Thus everyone is assured of his reward. In spite of all this, some States appear to be reluctant to procure the agreed amount, if higher prices are not granted by the Centre. Some defeat the purpose of the Central prices by restricting their scope in their areas. How then is the Centre expected to maintain the flow to deficit States and help in running the public distribution system?

TIME IS RUNNING OUT

Time is running out for the positioning of the procurement machinery adequate to cope with the bumper crop. Transport, hulling, drying and storage are some of the few facilities which are still being geared. Ultimately their magnitude and effectiveness depends on the goals to be achieved. Prof. D. R. Gadgil, while warning against further increasing procurement prices, had stressed the need for vigorous procurement right away by the beginning of November. But the wrangle on prices continues unabated. Meanwhile, a real and immediate danger lurks around. Hoarders are watching this wrangle hoping to benefit from political indecision and farmers' uncertainty. Something must be done and done fast, even with a little firmness and compulsion, if a start is to be made in price stabilising and if prosperity is not to beget poverty.

FOOD CORPORATION Has Come To Stay

THE Act creating the Food Corporation of India (FCI) was passed by Parliament in December 1964. Following production failure, prices had gone up and there was need for urgent action to bring some equity into the distribution system. Short-term measures had been tried and found ineffective. Among them were the tightening of licensing control over traders, restrictions on back advances against foodgrains, the idea of Grain Marketing Boards, fixing of maximum wholesale and retail prices, the ban on forward trading in a number of commodities etc. These could not be well administered; consumers, in a panic, started hoarding and there was the inevitable exploitation by the unscrupulous elements.

It was against this background that the Chief Ministers, in June 1964, accepted the idea of a food-grains trading corporation.

The FCI was set up with an authorised capital of up to Rs. 100 crore. It started buying early in 1965-66 and up to June this year had bought 30.48 lakh tonnes. Of the 70 lakh tonnes procurement target fixed by the Chief Ministers recently, the FCI is likely to accomplish between forty and fifty lakh tonnes.

Where the FCI functions as an agent of a State Government, it buys according to the levy order. If the levy is on the growers, it uses collection agents including primary co-operatives, district marketing societies and apex marketing societies. From the millers and crushers, the collection is direct.

The FCI has now spread its work to cover rice, wheat, coarse grains, millets, pulses, groundnut and oil, wheat products and blended flours, seeds and, as an experiment, spices. To popularise high-yielding varieties of paddy, it launched pilot projects to provide inputs in Andhra, Mysore and Madras against delivery of grain after harvest. It is planning to set up four modern rice mills and ancillary factories at a cost of Rs. 1.6

THE RISING GRAPH

The sales turn-over of the Food Corporation of India was Rs. 130.67 crore in 1965-66. In 1966-67, this would very probably be over Rs. 242 crore.

During 1966-67 the Corporation earned foreign exchange by exporting wheat bran through the S.T.C.

In 1967-68, the FCI's sales turn-over is likely to reach Rs. 350 crore.

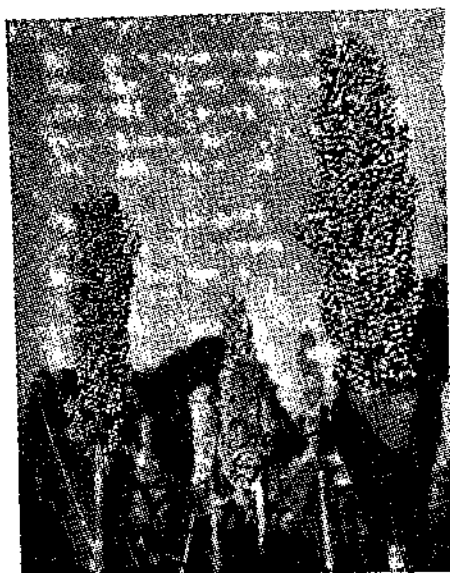
crore including a foreign exchange component of about Rs. 75 lakh which will be met by the FAO. The Corporation has concluded an agreement with a Japanese firm (under the yen credit) for the supply of five integrated modern rice mills and basic components for 19 more mills, besides spares and some farm equipment.

The FCI is implementing a production scheme of Bal Ahar, a balanced food for children. Its scheme of drying facilities in Thanjavur is explained elsewhere in this issue (Page 17).

Parallels Elsewhere

Organisations similar to the FCI exist in Australia (the Wheat Board), Canada (The Board of Grain Commissioners) and the U.S.A. (the Commodity Credit Corporation). In Japan the farmers have an obligation to sell rice to Government which has also control over marketing, though voluntary sales by producers and the autonomy of private collecting agents is encouraged. Agricultural co-operatives constitute nearly 90 per cent of the designated collecting agencies. In Ceylon, the Food and Agriculture Ministry buys the grain through Government commissioned societies and, in the case of paddy, through the mills also. In Burma, the marketing of farm produce, both internally and abroad, is the monopoly of the Agricultural Marketing Board.

TEN TONNES A HECTARE WITHIN SIGHT



AMBIKA SINGH

which has all India adaptability and a yield potential of more than 5 tonnes under top management. In Jowar, CSH-1 and CSH-2 are available. They all yield more than 5 tonnes per hectare.

In maize there is no such wide scale adaptability. Therefore, hybrids and composites suitable for different agro-ecological situations have been evolved. Their names, areas of adaptation, duration and yield potentials are given in Table-1.

Recently the Central Varietal Release Committee has released some composites. While in the case of hybrids fresh seed is needed each season, farmers can use their own seeds for composites. The details about them are given in Table-2.

Demonstrations conducted in 1966-67 Kharif and in 1965-66 for wheat are summarised in Table-3.

Wide-scale fluctuations in yields have been noticed in these demonstrations. Yield differences could be attributed to weather (uncontrollable part of the crop environment), technology (controllable

part of the crop environment) and management (precision with which the controllable part of crop environment is controlled). It is difficult to disentangle the effect of these three especially at our present level of knowledge.

New hybrids and varieties have responded to higher levels of fertilisation. But they give more yield than locals even when there is no or inadequate fertilisation.

In extension work it has been found that provision of good drainage makes all the difference in hybrid maize.

Wheat experiments have shown that first and last irrigations are very vital. During 20-30 days of seeding in wheat, crown-roots and tiller initiation take place. For these two activities to take place, the plant needs moisture in 0-2 cm layer of soil. This is achieved by irrigating at the stage of 20-30 days. Similarly at the time of grain ripening, water is needed.

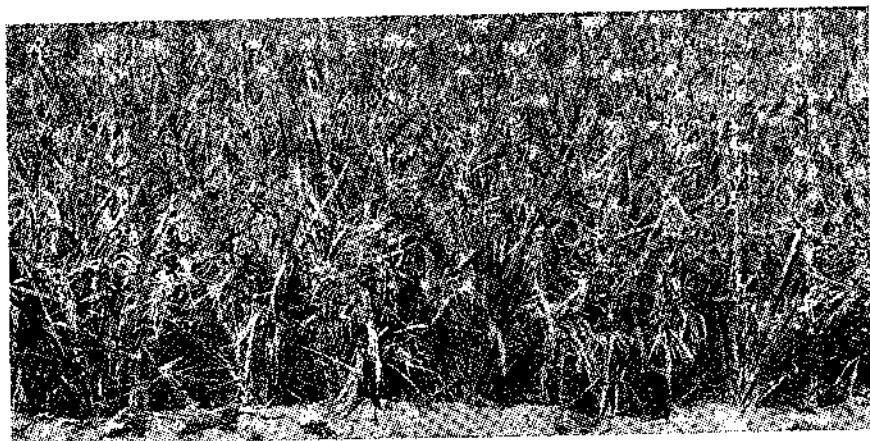
The new technology of agriculture requires plant protection measures right from the time of sowing

*Left above: A close-up of Jowar CSH-1
Below: A field of IR-8, a dwarf high-yielding paddy variety, bred at the International Rice Research Institute in the Philippines.*

THE science of farming has, in recent years, advanced much faster than the art of farming.

Genetic improvement of crop plants is the starting point of the new technology. Large yield increases are the direct result of better varieties and hybrids. Interactions of improved varieties with fertilisers, additional moisture and other inputs are substantial. Improved varieties are more easily accepted by farmers than any other yield-increasing change. Thus, better varieties clear the way for other yield increasing practices.

Among the new varieties in paddy are Taichung Native-1, Taichung-65, I.R.8 and Tainan-3. These have a potential of yielding more than 6 tonnes per hectare in about 4 months time during Kharif. In wheat Sonora-64, Lerma Rojo, Sarbati Sonora, S-227, Safed Lerma and Sonalika are available. All of them are dwarf varieties. They give yields of more than 6 tonnes per hectare under good management. In Bajra, H.B.1 is available



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(seed treatment) through all vulnerable stages of the crops.

Research has shown that green manuring is neither the most profitable practice nor is capable of increasing the organic matter content of soil in which wheat and sugarcane are grown in northern India. Long-term data from Pusa (1908-63) have shown that purely inorganic but balanced fertilisation of crops is conducive to higher yields and maintenance of soil fertility. Green manuring does not seem to have much value in raising the organic matter content of soil to a high level in sub-tropical climate. Long term experiments have shown that, apart from its nutrient effect, organic manures do not have much of cumulative effect.

As a corollary of this conceptual change and as a result of the



Kalyan Sona. Left : A high-yielding Bajra

planned in such a way that they will not only indicate the yield possibility of one crop but of a number of crops in a year where more than 10 tonnes of grain per hectare can be produced. A few years back no one could have thought of such phenomenally high yields.

Adaptive research—research to fit known improved techniques and

material to diverse conditions—is already in progress. This coupled with background investigations and investigations to improve understanding of physical and biological interactions in environment so as to permit the evolution of effective inputs will certainly transform our agriculture. The time is not far off.



availability of shorter duration varieties, multiple cropping has become not only feasible but beneficial. Rotations involving three or four crops per year are being evolved, perfected and popularised on land where the farmer has sufficient water at his will. When multiple cropping is adopted on a large scale, many soil management problems are likely to come up. For their solution, integrated research done by plant breeders, plant physiologists, soil scientists, meteorological physicists and agricultural engineers will be an absolute necessity. From this year onward national demonstrations have been

Table I

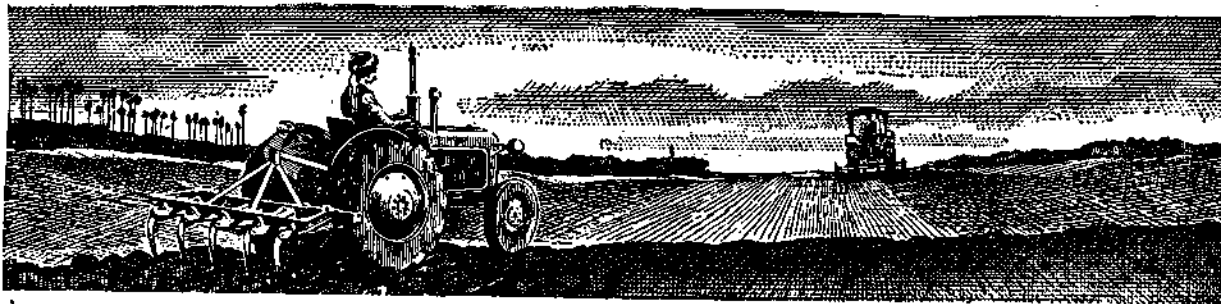
Name of hybrid	Area for which suited	Duration in days	Yield potential in quintals per h.a.
Ganga-101	Northern plains	95—100	45 to 60
Ganga-3	Northern plains	85—90	50 to 65
Ganga Safed-2	Northern plains		
Ranjit	Southern Rajasthan, Gujarat and Maharashtra	100—105	50 to 65
Deccan	Penninsular India	105—110	50 to 65
Himalayan—123	Himalayan hills	110—120	65 to 75
Hi-Starch	All maize areas	100—110	50 to 70

Table II—Composites of Maize Recommended for Different Zones

Name of composite variety	Area for which suited	Duration in days	Yield potential in quintals per hect.
Jawahar	Northern plains	100—110	45—60
Amber	Himalayan hills	110—120	50—80
Vijay	Punjab, Haryana and Western U.P.		
Sona	Punjab, Haryana, Western U.P. and Rajasthan	100—110	50—60
Vikram	Delhi, Gujarat, Punjab, Haryana, U.P. and Rajasthan	90—100	50—60
Kisan	Eastern U.P., West Bengal and Orissa	95—100	45—50

Table 3

Crop	No. of demonstrations	Mean yield kg/ha.	Range kg/ha.
Paddy (T.N. 1)	66	5804	3053-10789
Hybrid Bajra	91	3233	0280-6700
Hybrid Jowar	33	2373	0200-5500
Hybrid Maize	47	4325	1160-7420
Draft wheat	24	4391	2028-6800



breaking new ground... Dunlop is at the root of this modern agriculture

As the old agricultural methods gradually give way to the new, mechanised and scientific farming helps the Indian farmer to cover much more ground and produce a greater yield per acre than was possible before.

In this drive for more food-grains and other crops, Dunlop is helping in a fundamental way—with tractor tyres for better, faster ploughing, with Transmission and Vee belts for lift irrigation and agro-industries. And Dunlop also pioneered the manufacture of pneumatic tyres for bullock carts which greatly improves the efficiency of these vehicles—a fact of vital importance since bullock carts play such an important role in the country's transport system.



DUNLOP INDIA

—keeping pace with India's Farm Modernisation



DPA-188

IS GUJARAT'S BAJRA PROGRAMME AMBITIOUS ?

D. A. PATEL

Indian Institute of Management, Ahmedabad

THE High Yielding Variety (HYV) Programme was implemented in Kharif 1966 in all the States. In its broad essentials, the strategy envisages intensive cultivation with improved seeds in selected patches where irrigation is assured, and with sufficient inputs of fertilisers and pesticides. To enable farmers to use increased inputs required for growing high yielding varieties, they were guaranteed adequate credit.

A target of 49 lakh acres of area was first fixed for different high yielding varieties of cereals during Kharif 1966-67. The targets fixed for each variety for Kharif 1966-67 and 1970-71 are given below in Table 1 for Gujarat and All India.

In Gujarat State, the HYV Programme was launched for the hybrid varieties of Bajra, Jowar and maize in all the districts. These are mainly rainfed (Kharif) crops and are grown on about 75 lakh acres. The trend in the cultivated area under these three crops during last three Plan periods is given below :

Period	Area under the crop (lakh acres)		
	Bajra	Jowar	Maize
1951-56	51.8	38.5	4.9
1956-61	38.4	34.2	4.9
1961-66	33.4	32.9	5.9

It would be clear from the above that the area under Bajra and Jowar decreased substantially while it increased marginally under maize in the last fifteen years. This is because Bajra and Jowar were replaced in many places by cash crops like cotton and groundnut.

This, in turn, was due to the low yield rates of Bajra and Jowar. The net incomes per acre would be higher with cotton and groundnut. This substitution of foodgrains by cash crops further increased the food deficit in Gujarat to about 12 lakh tonnes. This deficit represents almost 50 per cent of the total foodgrains production in the State.

Assuming that the area under foodgrains would not go down further, the 1961-66 average yield of 488 lbs. per acre would have to be more than doubled at the end of Fourth Plan so as to bridge the gap between supply and demand. The requirement of foodgrains in 1970-71 will not be less than 51 lakh tonnes for an estimated population of 264 lakhs. The present level of foodgrains production (25 lakh

tonnes during 1961-66) would have to be stepped up at an average annual rate of 20 per cent in the next five years to meet the projected needs of the State. It is in this context that the introduction of the HYV Programme has offered a challenge to the farmers of Gujarat.

According to its Fourth Plan targets, Gujarat hopes by 1970-71 to push up its foodgrains output by 12.66 lakh tonnes. This increase will be shared by paddy 1.32 lakh tonnes, wheat 1.62 lakh tonnes, Jowar 1.70 lakh tonnes, Bajra 6.77 lakh tonnes, maize 1.07 lakh tonnes and others 0.18 lakh tonnes.

Seventy per cent of this increased output is expected to come from hybrid varieties of Bajra, Jowar and Maize. For hybrid Bajra alone, the target of increased production is 6.50 lakh tonnes.

TABLE 1 : Targets of Area under High Yielding Varieties

Crop	(Area in lakh acres)					
	Actual area cultivated 1965-66		Targets of coverage			
			1966-67 (Kharif)		1970-71	
	Guj.	All-India	Guj.	All-India	Guj.	All-India
Paddy	12.53	864.86	—	25.00	—	125.90
Wheat	13.24	316.29	—	5.13	—	81.84
Jowar	32.65	425.02	0.10	5.17	6.00	40.00
Bajra	36.61	281.70	1.00	5.29	32.00	40.00
Maize	5.59	116.14	0.15	8.59	3.00	40.00
Total:	100.72	2004.01	1.25	49.18	41.00	326.84

TABLE 2

Crop	Yardstick for additional production		Area targetted		Target of additional production	
	(1)	(2)	(1)	(2)	(1)	(2)
	(Tonne/acre)		(Lakh acres)		(Lakh tonnes)	
Bajra	0.25	0.20	2.00	30.00	0.50	6.00
Jowar	0.25	0.20	1.50	4.50	0.38	0.90
Maize	0.50	0.25	1.00	2.00	0.50	0.50
Total:			4.50	36.50	1.38	7.40

1—Irrigated areas. 2—Unirrigated areas.

In fixing these estimates of additional production composite yardsticks for all inputs have been employed. Separate calculations have, of course, been made for irrigated and unirrigated areas under Bajra, Jowar and maize. The yardsticks and the estimates of additional production for hybrid varieties of Bajra, Jowar and maize are given in Table 2.

Before releasing the hybrid variety of Bajra (HB-115), the millet specialist, who had evolved this variety, conducted some trials in different districts of Gujarat. The results were promising. However, no official statistics on average yield per acre of hybrid Bajra grown by farmers, after releasing the variety under HYV programme, were collected. These statistics are essential in order to estimate the yield variations and the average level of yield. That is the only way of assessing the yardsticks used in framing the estimates of additional production.

In 1965-66, the average per acre yield of local Bajra in Gujarat was 191 kg. If this can be stepped up by a minimum of 200 kg, the average yield to be achieved by 1970-71 would be 391 kg. per acre. This yield rate would certainly be within the reach of farmers and, therefore, the estimate of 6.50 lakh tonnes of additional production for hybrid Bajra might be regarded as conservative, since some 32 lakh acres of additional area is proposed to be brought under hybrid Bajra.

There is, however, the question whether all the farmers would take to this hybrid variety, whether they would cover all their land with this, and further whether they could do so within five years. Not all the high yielding devices are readily accepted by all the farmers, as was the initial experience with fertilisers.

In the United States a study of response to hybrid seed corn in Iowa indicated that it took 13 years to persuade almost all the farmers to adopt the new variety. It took six years for the first 6 per cent to adopt it, while over 80 per cent adopted it in the next six years. One cannot assert that Indian experience would be better. Further, the production and supply of pure hybrid Bajra seed to farmers in every season is a tremendous

task and it calls for very efficient management in production and marketing.

Optimistic Estimate

In the light of the first year's experience, the target of 32 lakh acres of new areas to be brought under hybrid Bajra by 1970-71 would appear to be optimistic. During Kharif 1966, the target of area coverage under hybrid Bajra was 1.50 lakh acres, while the actual coverage was 36,700 acres only. The target was not achieved due to inadequate supply of hybrid seed. In summer 1967, though sufficient quantity of seed was available, the actual coverage was hardly 32,000 acres as against the target of 60,000 acres. In view of this, the State had to reduce original target of 5.39 lakh acres for 1967-68 (both Kharif and summer) to 3.70 lakh acres (Kharif 2.70 and summer 1.00). It was reported that for Kharif 1967, the State had again raised the target to 4 lakh acres in view of the availability of about seven lakh kgs. of seed. However, latest official reports indicate that the area brought under hybrid Bajra is hardly 2 lakh acres.

According to revised targets (which do not affect the 1970-71 figure of 32 lakh acres) it is hoped that the area under hybrid Bajra would go up by 10.2 lakh acres in 1968-69 alone. This is a challenging task. One wonders whether the implications of ambitious area planning in terms of production and storage of seed, supply and proper use of fertilisers, arrangements for credit etc. have been sufficiently understood.

It is said that the Gujarat farmer has a commercial approach to farming and since hybrid Bajra has a high yield potential, there is every possibility of not only his taking to it but also of his bringing some of his cash crop area under hybrid Bajra. This hypothesis might work out over a long period if the price continued to be very much in favour of Bajra. But over a short period, the assumptions might prove false, particularly because the farmer is slow in accepting technological changes in agriculture. In the case of Bajra the Gujarat farmer has been growing the local variety for several years and has known it very well. He is

familiar with what it needs in terms of quality of fodder, pest resistance devices, water etc. The specific requirements of hybrid Bajra such as purity and price of seed, cultural and manurial practices, amount of water etc. are as yet unknown to the farmer. He may, therefore, not take to the new variety as fast as is now envisaged. Besides, one bad impression—and this may be caused by one of many factors arising during the experimental stage—may quite lead the farmer to give up the experiment.

There are other factors too, like initial costs, and fertiliser and water needs. In view of all this the 32 lakh acre target seems rather ambitious.

HELP FLOOD VICTIMS

"An almost superhuman national effort during the last two years has enabled us to meet the challenge posed by unprecedented drought. Now we have severe floods ravaging many parts of the country rendering large numbers of our fellow citizens homeless and destitute. They need immediate help and relief. I appeal to you to donate generously to the Prime Minister's National Relief Fund so that much needed help can reach the men, women and children who are in distress."

—INDIRA GANDHI

Contribute Generously to
Prime Minister's National Relief Fund

Contribution may be sent

To The Secretary
Prime Minister's National
Relief Fund
Prime Minister's Secretariat
New Delhi

davp-67/F4

THIS INDIA

YOJANA invites contributions to this feature from its readers all over the country. Each anecdote must be true to life, of less than two hundred words, capturing something significant of India's rich and varied life. Each published anecdote will be paid for.

I was a villager. I was trained as a tanner at a Government centre for leather making. I belong to a poor but respectable caste Hindu family. Many of our villagers sneered at me when they knew that I was working as a tanner at the centre. My community boycotted me when I argued, in the name of Gandhiji, that no work was low if it served the society. But they called me a cobbler and treated me as an untouchable.

After the training, I started a tanning training centre in my village with assistance from the Government. I also set up a workshop for making shoes and other leather goods. Soon my earnings improved and I became a 'big man'.

Now I own a car, a lorry and a big building. In recruitment to the training centre and the workshop, I give preference to persons from my village, irrespective of their caste and creed. Many young people take advantage of this facility in spite of opposition from their parents and other relations. Many villagers who once hated me now come to me for donations and other charity. I help them all as far as I can.

Gauhati *Bhagirath Rabha*

On a Sunday evening while waiting for a bus two policemen brought to the bus stand a well-clad gentleman, apparently educated, in chains. I asked one of the policemen who the gentleman was.

The policeman replied "He is no gentleman, he is a bluffer. In today's market this man posed himself as an inspector of weights and measures, extracted money from villagers as fines for not using metric weights. One of the villagers got suspicious and informed us. That is how we got him".

Barbaruah *Upendra Nath Konwar*
(Assam)

paddy, was frantically trying to sell it. A well-known black marketer came to him and agreed to buy the entire stock at Rs. 2000/-. They wanted to wait for darkness to set in to complete the transaction. The black-marketeer gave him Rs. 200/- as advance and went away. At about 10 P.M. that night he came back in a lorry. He gave the balance of Rs. 1800/- to the seller and left the place with the paddy.

Next morning the happy cultivator went to deposit the money in the bank. As soon as the cashier received the 18 hundred rupee notes, he became angry and shouted, "Where did you get these counterfeit notes? Are you trying to cheat the bank?"

Manisseri *S.V. Vijayan*

I was travelling from Dhond to Sholapur by the Madras Mail. The compartment was overcrowded and I could only stand on one leg with the suitcase on my shoulder. A ticket-checker got in at a station and found out seven ticketless passengers. Six of them were poor people. The seventh one was an educated young man wearing a Gandhi cap.

At Kurduwadi, the ticket-checker got down taking the Gandhi-capped young man with him. While he was passing by me, I asked the ticket collector why he was not taking the remaining ticketless passengers, and why he was particularly taking the young-man with him. He frankly told me that on August 15, when the Government was releasing some prisoners, he did not want the dubious credit of putting some destitutes in prison. He was particular about the youngman because he was educated, he had the means to pay the fares but was avoiding it, and while cheating the nation he was wearing the Gandhi cap.

Dhulia *S. R. Hawaldar*

Whenever Parbati, our washer-woman, would come to our house my mother would enquire about her family. The washer-woman revealed that one of her daughters-in-law had been staying with her parents for a pretty long time. My mother asked her why she did not bring her back. She answered that she wanted her son to marry again. To my mother's reprimand the answer was, "Her parents are demanding three hundred rupees before they return her. Now, why should I spend three hundred rupees for an old daughter-in-law, when I can get a new one by spending the same amount?"

Chandernagore (W.B.) *Asok Som*

Soon after the harvest, Government had collected the levy from paddy cultivators. Some big cultivators, however, managed to hoard large quantities of paddy for selling in the black market during lean months. One day a big paddy cultivator, who had hoarded about 200 Paras of

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Brooke Bond sold to 6 lakh shops last week and will be selling to 6 lakh shops every week—covering every important shop in India.

Brooke Bond make so many calls in order to serve such a vast sales area—stretching from Jorhat to Junagadh, Kashmir to Kanyakumari.

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Result: the finest distribution system in the country.

The strategic location of Brooke Bond's 6 factories enables speedy delivery to sales points—and so ensures an effective distribution of fresh stocks everywhere in India.

"To do this we use motor vans, to get fresh stocks through every

hand vans, bullock carts and even camels week," says a Brooke Bond Sales Manager.



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QUOTATION BOX

I was recently asked by some French institutions to give a series of lectures on Indian literature. After one lecture in Paris, in which I tried to give the audience a very general idea of contemporary Indian literature, a French boy—hardly 18 and, as I later learnt, a grandson of a Nobel Laureate in Physics—asked politely: "Do you believe that a country which cannot produce its grain and must depend for its food on foreign nations can produce anything worthwhile in the world of ideas?"

—Mr. Lokenath Bhattacharya in
"The Statesman"

Its (Hindi's) very poverty of literature makes it easy to learn, and even the proud Tamils have ungrudgingly absorbed into their language Hindi's rich vocabulary of abuse.

—Mr. K.R. Sundar Rajan in
"New Statesmen"

Some people thought our little Maharaja was out of tune with the new age and should be sacked. My colleagues and I insisted he should stay. After all, the little fellow had served us well and had no privy purse to fall back on.

Mr. J.R.D. Tata

Entry by the "backdoor" into the chamber of any Minister in the Madras Secretariat has now become an established practice.

From "The Hindu" Staff
Reporter's Diary

Doctors in India are like politicians. Both are ignorant.

—The late Dr Lohia

Written by men, anti-abortion laws cannot quell the desperation of women for whom a particular pregnancy is a hateful foreign object. At their time of despair, women agree with Author Marya Mannes, who reviles such laws as the work of "the inseminators, not the bearers."

—From "Time"

Khrushchev's reaction to the Lazarus of Epstein when he visited New College chapel in 1954 was not so much ideological as common. It caused Epstein to telegraph to the warden: "Tell your guest to keep off art criticism, which he does not understand, and stick to his own business, which is murder."

—From "The Statesman" Editorial

If there was any folly committed by the scientists it was the discovery of atom.

—"The Radical Humanist"

Commas as well as decimal points are used today in giving figures, and much confusion results from the comma looking like a decimal point, and vice versa.

—C.R. in "Swarajya"

In Britain, as is well known, a gentleman never "runs" for Parliament—he "stands"

—Mr. Karl Mayer in a letter to
"International Herald Tribune"

At Dak To...an entire South Vietnamese regiment has taken itself out of action in order to concentrate upon supplying the 173rd U.S. Airborne Brigade base with beer, prostitutes and laundry service.

—"Newsweek"

The Railway Minister, Mr C.M. Poonacha, was asked by a pressman whether he had missed any train.

"Not after I became Minister" he replied. "Earlier I have missed even main trains".

—A PTI report

LOOKING BACK

YOJANA November 3, 1957

It has been estimated that to carry the normal feeder traffic (i.e. traffic from farms and factories to railway stations and ports, from there to godowns and from godowns to shops and consumers) generated by the Second Five Year Plan, a minimum of 2 lakhs of additional trucks (3½ lakhs, including replacement) may be required by the end of the Second Five Year Plan.

We have now an automobile industry in the country with a production capacity of about 50,000 vehicles per annum. It provides employment for about 10,000 persons. With schemes of expansion which are on hand, this capacity can be raised to about 57,000 vehicles per annum by 1960-61 which is the target for this industry. Of these, 40,000 are to be trucks—the most important vehicle both for passengers and goods.....

The extent to which travelling habit has developed in our country can be seen from the fact that while in 1931-32 only about 3,900 persons per million of our population travelled by rail, the number in 1955-56 was about 9,100 i.e. nearly 2-1/2 times.

DEVELOPMENT DIARY

OCTOBER 5 TO OCTOBER 18, 1967

October 8

The Gujarat Oil Refinery begins supply of the gas produced in Gujarat oil fields for domestic use. 1,400 gas cylinders are being released to the market.

October 9

The Union Government sanctions one crore rupees as loan to the Government of Andhra Pradesh for meeting expenditure on the Nagarjunasagar Project in the current year, bringing the total amount of loan sanctioned for the Project since 1955-56 to Rs. 1,34,16,40,399.

An aero-engine installation and removal stand, manufactured by a Poona firm, is formally handed over to Air-India at the Santa Cruz Airport at Bombay. It cost only a third of an imported engine.

October 11

An agreement is signed in New Delhi between the State Trading Corporation and a Czechoslovak firm under which India will import 2,000 tractors from Czechoslovakia. The tractors will be sold through public sector organisations like Agro-Industrial Corporation, in Punjab, Haryana, Uttar Pradesh and Bihar.

A permanent laboratory of the Psycho-Technical Cell of the Railways is opened in New Delhi.

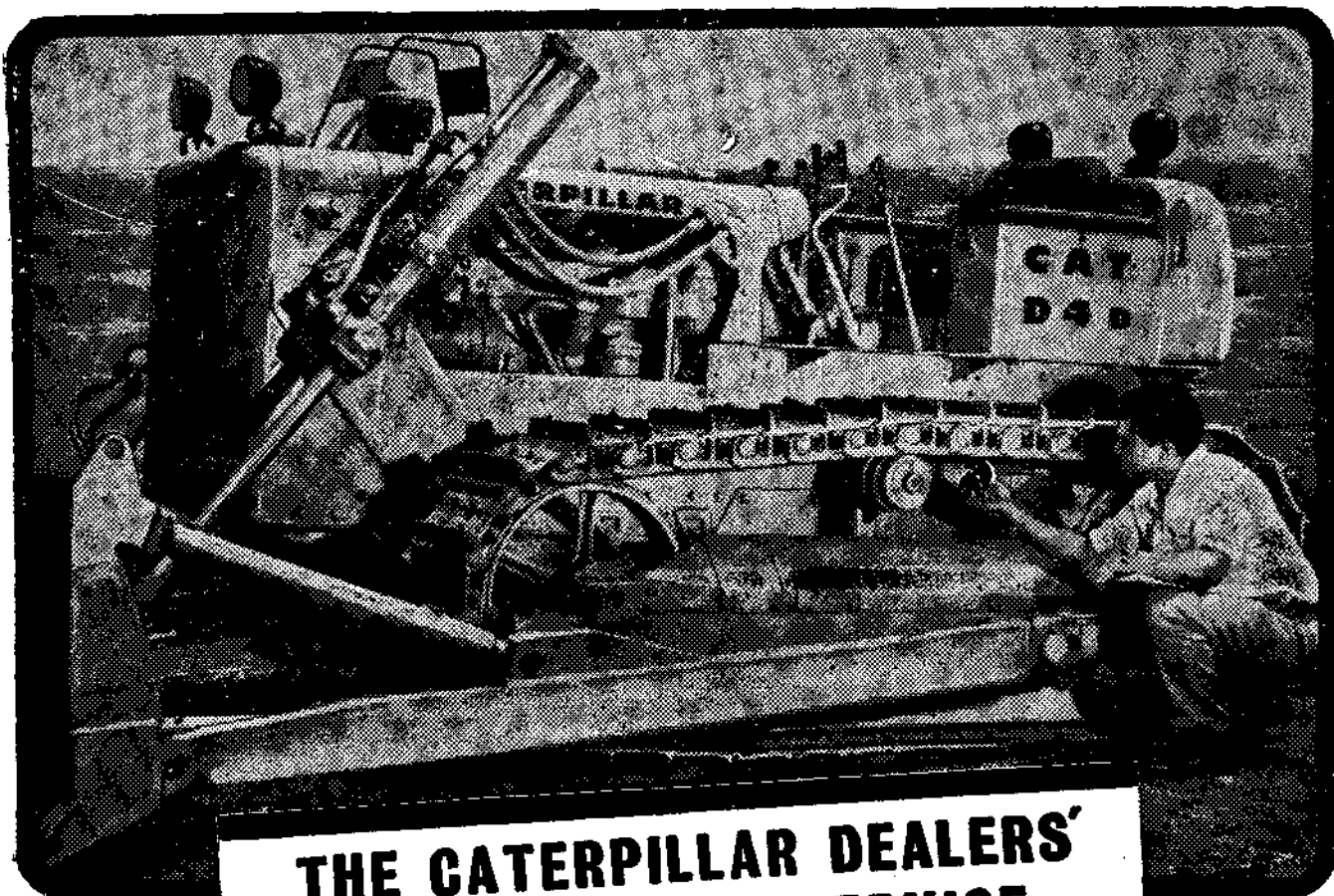
The satellite communications research and training centre set up at Ahmedabad is commissioned. It is designed to equip India as a vital relay station between Europe and the Far East in the worldwide satellite communications system, and as a source of information on tropical conditions.

October 13

An agreement is signed in New Delhi between the Industrial Export, a Rumanian Government Agency, and the Government of India for the setting up of the proposed oil refinery at Haldia. Rumania will supply plant, equipment and technical services for the manufacture of fuel oil, bitumen and lubricating oils. Two agreements have already been signed with French agencies who are also collaborating in the project. The refinery will have an annual capacity of 2.5 million tonnes. It will be set up by the Indian Oil Corporation at a cost of Rs. 46 crore.

October 16

The foundation stone of the Hyderabad-Poona micro-wave system is laid in Hyderabad. The project is estimated to cost Rs. 1.31 crore.



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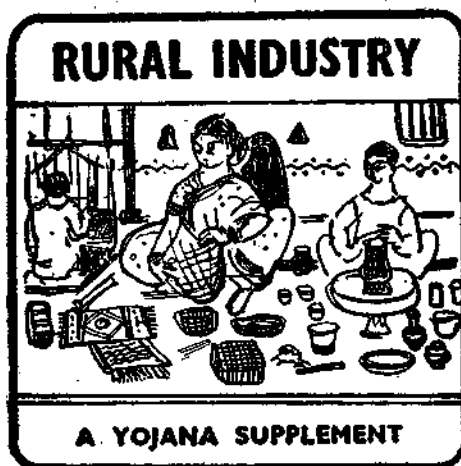
DARJEELING PROJECT

The project is spread over 638 sq. miles covering five C.D. Blocks and a population of 2.6 lakh. A part of it lies in the plains, the rest in hilly region. It gets very heavy rainfall during monsoons. About 30 percent of the area is covered with forests while another 32.5 percent is under cultivation.

At the time of the inception of the project there was no large scale unit and only 268 small units carrying on 28 types of industrial activities.

At present there are 402 units with 40 types of industrial activities. Of these, 80 are in jute weaving, 41 in dairy farming, 32 in tailoring, 28 in piggery, 24 in carpentry, 24 in pine apple cultivation, 16 in handloom weaving and 10 in poultry farming. Their total investment is estimated at 4.45 lakh with gross production at Rs. 7.62 lakh. They provide full-time and part-time employment to 761 persons.

After coming into being of the project, 135 new units have been established (81 with the project help) with an estimated additional investment of Rs. 2.78 lakh and gross production of Rs. 2.48 lakh. They have generated additional full-time and part-time employment for nearly 300 persons.



BEAUTIFUL BUT BACKWARD AREA AWAKENS TO NEW LIFE

DARJEELING Rural Industries Project located on the southern slopes of Singalila range of the Himalayas with altitude varying from 900 ft to 11,000 ft above sea-level, has many scenic attractions and tourist resorts. Covering five Community Development Blocks, namely, Darjeeling-Pulbazar, Kalimpong I and II, Siliguri-Naxalbari and Kharibari-Phansideva, with an area of 638 sq. miles and a population of 2.60 lakh, the Project is sufficiently rich in natural resources but poor in skills and entrepreneurship. Except in the last two mentioned blocks which lie at the foot-hills, there has not been much of industrial activity. For miles and miles around Siliguri and on the slopes towards Darjeeling, one comes across a bottle green carpet of tea-bushes, well pruned and flat-topped, which have made Darjeeling famous all over the tea-drinking world. Nearly 11 percent of the total area is under big and small tea estates which employ hundreds of men and women as labourers. Among the food crops paddy takes the pride of place accounting for more than 50 percent of the total cultivated area. Nearly one third of the total project area is covered with forests yielding timber, charcoal, fodder, bamboo and medicinal herbs. The cash crops include jute, ginger, cardamom major and oranges. The Pro-

Text and Photographs by
J. L. SAAZ

ject area sends out tea, jute, forest products and hides and skins while it brings in food-grains and textiles, the value of exports being more than the value of imports. Except for a few towns of tourist attraction which are well connected and electrified, outlying areas have all the attributes of a backward hill economy—inaccessibility and isolation, lack of capital and skills, and inadequate development of infrastructure such as electricity, roads and banking facilities. Spread of education and building of roads have of late begun to break the barriers of isolation.

SKILLS IMPROVE

Against this background, the project has made considerable headway in imparting new skills or improving the existing ones in tile and brick making, wool-knitting, carpentry and basketry as also in allied agricultural activities such as sericulture, bee-keeping and floriculture. For most of these activities the project has started training centres at various suitable places, trained a number of men and women in various skills and trades, and in most cases organised them into cooperative societies, allowing them the use of

sheds and machinery of the training centres and the benefit of the guidance of their erstwhile trainers.

WAGE LEVEL GOES UP

A tile making-cum-training centre was started by the Project in 1964 at Phansideva, 12 miles from the growing industrial town of Siliguri. It has so far trained 51 persons in tile making. In 1965, a cooperative society with 42 members, mostly ex-trainees was started, for which the project contributed Rs. 45,000 as capital goods, machinery, subsidy and provision of instructors. The share capital of the members came to Rs. 2296. From all accounts the society is doing well; it showed a profit of more than Rs. 1,000 in 1966-67 by producing tiles worth Rs. 20,000. Good quality soil for making the tiles is available on the banks of the nearby Balasan river flowing past the Kantivitha village. Most of the trainees belong to the scheduled tribes and were previously working as landless labourers on a pittance of Re. 1 or Rs. 1.50 a day. Now they earn from Rs. 2.50 to Rs. 3 a day.

Chuyan Oran, 30, the enthusiastic secretary of the cooperative society, is one of the best tile-makers here. He was a landless labourer working on paddy land or tea gardens, getting Rs. 12 a week.

MAXIMUM EMPHASIS ON TRAINING PROGRAMMES: 311 TRAINED IN 10 TRADES, 282 ADEQUATELY ABSORBED

After receiving a year's training in the tile making centre he switched over to his new profession and with good results. His two daughters have since joined him in tile-making, each earning Rs. 2.50 a day. His wife, son and mother are still working on jute fields, and thus the income of the family has gone up atleast by Rs. 4 a day. The measure of his 'new-found prosperity', as his instructor jocularly remarked, was reflected by the new tiled roof over his small house which previously had a thatched covering. The demand for tiles is likely to go up as tiling of the roof does symbolise improvement in status, and with this the tile-makers are bound to flourish.

Mr. Sachindra Chakarvarti, 40, who is a refugee from Pakistan and has worked as a peon in the industries office, is now an instructor in the training centre, getting about Rs. 120 per month. He had background in tile-making specially in the firing of tiles which he had learnt at his native place in East Pakistan. He was put as instructor after a week's training in Tamluk Project. He would, however, do much better with some advanced training.

MORE WORK

The workers at the brick making-cum-production training centre at Bidhan Nagar, 26 miles from Siliguri, proudly displayed their bricks with the 'RIP' mark. In this centre which was started in April, 1965 three batches of trainees, totalling about 60, have already been trained out of which 55 have joined the cooperative society for brick-making. The members contributed a share capital of Rs. 1726, and during the year 1966-67, the cooperative showed a profit of Rs. 3,500.

Sommurmu Santhal, 55, who used to work as agricultural labourer for 6 months in a year getting Rs. 2 to 2.50 daily, is now employed for 8 months in a year in brick-making and his average daily earning has gone up to Rs. 5. Similarly, Dhyano, 22, of village Bidhan Nagar who received training in brick-making for one year with a stipend of Rs. 20 per month, is now earning Rs. 2.50 to Rs. 3 a day. Jatru Hemrom, 30, also a Santhal with a defective right leg, appeared to be the happiest of the lot. He averred that he was now getting more work in a year and

better wages with comparatively easy work; he moulds bricks which saves him from running about in the fields. During peak season the cooperative employs 100-150 workers and the place looks like a beehive of human activity.

KNITWEAR SELLS WELL

Training in woollen knitwear seems to be very popular with the lower middle-class women in Darjeeling and Kalimpong. The Darjeeling knitting training centre has a capacity of only 15 for each session but there were more than 200 applicants. In the first two sessions 29 women have been trained in this very useful art while 18 more (including three non-stipendary trainees) are getting training in the third session. All the 29 trainees have been organised in a knitting co-operative society (22 of them are working members while 7 are sympathisers). The society with a paid-up share capital of Rs. 2,060 has been working since April, 1965 with Mr. K. B. Tamang, the young and enthusiastic economic investigator of the Project as its honorary secretary. It produced various artistic and utility items like cardigans, frocks, etc., worth about Rs. 55,000 making a profit of Rs. 5,000 during the first two years of its existence. It was a pleasure to watch the members of the society working on modern art knitters in the Red Cross premises in the heart of Darjeeling. There are 29 machines in all, 15 of them are individually owned while 2 have been received by the society on 50 per cent subsidy from the All-India Handicraft Board. In spite of the fact that the society has been experiencing shortage of working capital, it seems to have done well during the first two years as is evident from its sales which were of the order of Rs. 42,000. The products of the society were observed to be one of the fast moving items at the co-operative sales emporium (organised by the Project) in the main bazar, where tourists vied with one



Some of the tribal women who have been trained in brick-making at the centre at Bidhan Nagar.

another in purchasing cardigans and other knitted items. There is, however, need for expanding sales activity by seeking outside markets. The society requires financial assistance to increase its holding capacity and stocks of raw materials.

How the wool-knitting activity has helped the needy women of the area was evident from a casual talk with some of the workers of the society. Mrs. Pampha Pradhan whose husband is a teacher in the municipal boys' school, is handsomely supplementing the meagre income of her husband. She is earning Rs. 90-100 a month with the help of her art knitting machine, whereas previously she could earn only Rs. 30 a month through hand-knitting. She is educated up to 8th class and has a six-year-old son on whom 'I can bestow better care so far as his food and schooling are concerned due to our increased income,' she beamed with joy as she said these words. Mrs. Nima Lhamu is another beneficiary from this training programme. She belongs to an agricultural family and daily comes to the centre from Aloobari basti, a small village two miles from the city. She has to support her younger brothers and sisters and as such the income of Rs. 100 per mensem from knitting is most welcome to her family. Similarly, Mrs. Pushpa Pradhan of village Suntaley, 6 miles from Darjeeling, supplements the earnings of her husband who is a 4th class government servant in Darjeeling municipal committee getting Rs. 100 a month. With



(Above) Modern art knitters have proved instrumental in giving decent wages to women.
(Bottom) Brisk activity at the tile making-cum-training centre at Phansideva.

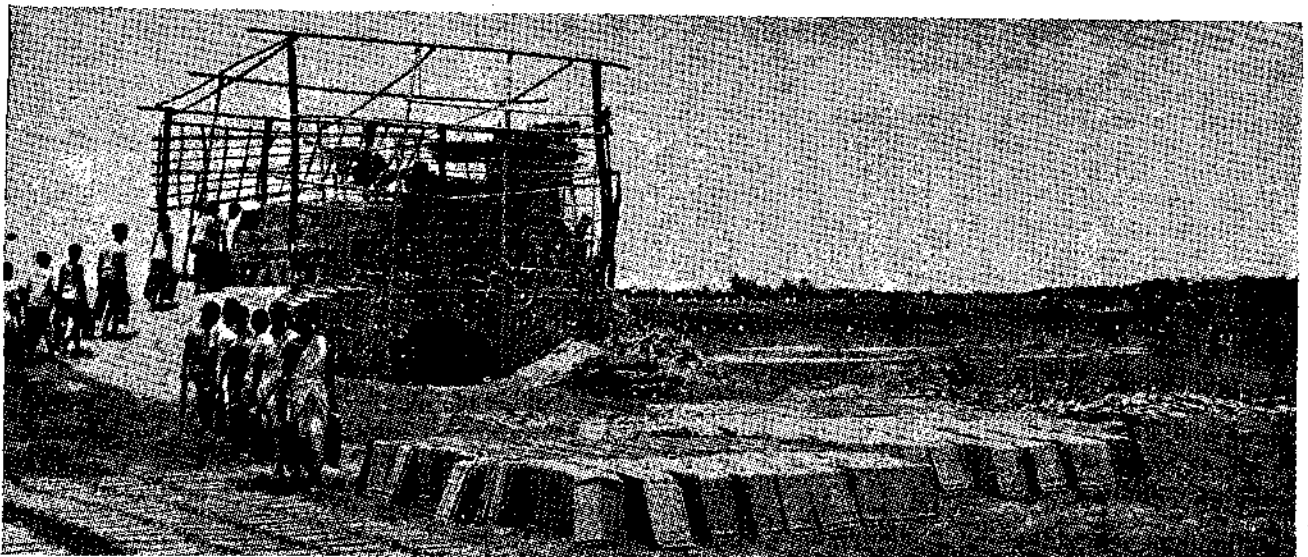
this training their income has almost doubled and she was happy that now they could live better with their two sons, eight and six years of age.

In the wool-knitting training centre at Kalimpong, 15 trainees of the first batch have since been organised into a co-operative society while the second batch of 15 trainees is undergoing training. There are 10 knitting machines in the training centre while 15 are owned by the cooperative society. Out of these 15, six were made available on 100 per cent subsidy, three on 50 per cent subsidy, two were purchased by the cooperative society, while four are individually

owned. Here again, the average daily income of a member of the cooperative society comes to Rs. 3 a day which is quite handsome considering the rate of agricultural labour and paucity of openings for women workers.

CREATING NEW SKILLS

In another sphere, namely, that of carpentry, the project has rendered a yeoman's service in creating new skills, and thus enabled the trainees to earn a better living. In the carpentry training centre at Bijenbari, about 22 miles from Darjeeling, 42 persons, mostly agriculturists, have already received



training in three batches while 15 more are undergoing training in the fourth batch. The trainees are taught to handle improved implements and are imparted training in making modern as well as traditional items of every-day use such as chairs, tables, cup-boards, doors and windows, etc. Immediately on completion of training a carpenter is able to earn Rs. 4-5 a day and as he gains experience he can earn even up to Rs. 10 a day. Most of the trainees of this centre have been absorbed in the carpentry trade; some working in nearby villages while others have been engaged on the Chhota Rangeet Bridge. The centre is maintaining individual record of each ex-trainee so as to know of their proper fixation.

The other carpentry training centre at Pedong, about 13 miles from Kalimpong, is also doing a good job. Of the 14 who came in the first batch, 12 passed and 7 of them are now working as skilled carpenters earning Rs. 4-6 daily. Fourteen more persons are undergoing training in the second batch. There is good demand in the area for skilled carpenters for house-building as well as for furniture items, and as such the carpentry training programme is meeting a felt need thereby equipping the trainees with skills to attain a higher wage level than ordinary labourers. The saturation point has not yet been reached here, and the training course is proposed to be continued for another one or two sessions.

Darjeeling Project area abounds in cane and bamboo, and there is a bamboo training centre near Kalimpong where items of everyday agricultural use such as winnowers and crude baskets are being made. In this training centre some improved and sophisticated bamboo items such as lamp stands, photo frames, umbrella handles, flower vases etc., can easily be introduced so as to cash in on the tourist traffic in the area.

WELCOME SUBSIDIARY INCOMES

Keeping in view the background and the need of the area much emphasis has been laid on the development of subsidiary occupa-

tions like sericulture and bee-keeping and certain other activities allied to agriculture—dairy farming, poultry and piggery. Floriculture in this Project is a class by itself, earning foreign-exchange and heightening scenic charms of the area.

We had our first glimpse of an extensive sericultural effort in the lovely Relling, a peaceful tiny village straddling across a narrow valley at a height of 4000 feet., and wearing a thin veil of mist at the time of our visit. Relling is situated five tortuous miles up Bijenbari and provides a refreshing contrast to it; the latter is located at the bottom of a deep gorge and presents a much busier look as the terminal station of a rope-way transport system with Darjeeling at the other end. There, Mrs. Josodha Devi Sharma, supervisor of the agricultural training centre, led us up and down the stony pathways to half-a-dozen houses of agricultural families who have taken to silk-worm rearing to supplement their small incomes. She had already trained 10 persons while 10 more were under training. The ex-trainees were happy that they were able to have an additional income ranging from a minimum of Rs. 85 to a maximum of Rs. 300 in a year. In all 28 persons have completed the one-year training-course in sericulture, and all of them without exception have stuck to it. They received a subsidy of Rs. 100 each. In addition, 20 families were imparted instruction in silk-worm rearing at their places, and they too are following the profession.

Through the bee-keeping training centre at Relling 104 peasants have received training in this subsidiary occupation, while 95 others are currently under training. Subsidised bee-boxes are distributed among interested parties and training is imparted at their door-step by the instructor of the centre. A farmer with one bee-box can have an additional income of Rs. 75 a year without much effort or investment.

NEW DIRECTIONS

There was no piggery unit in the area prior to the inception of the project; now there are 28 such units, 20 of which have been established with the financial assistance-

Rs. 12,500—provided from the nucleus funds.

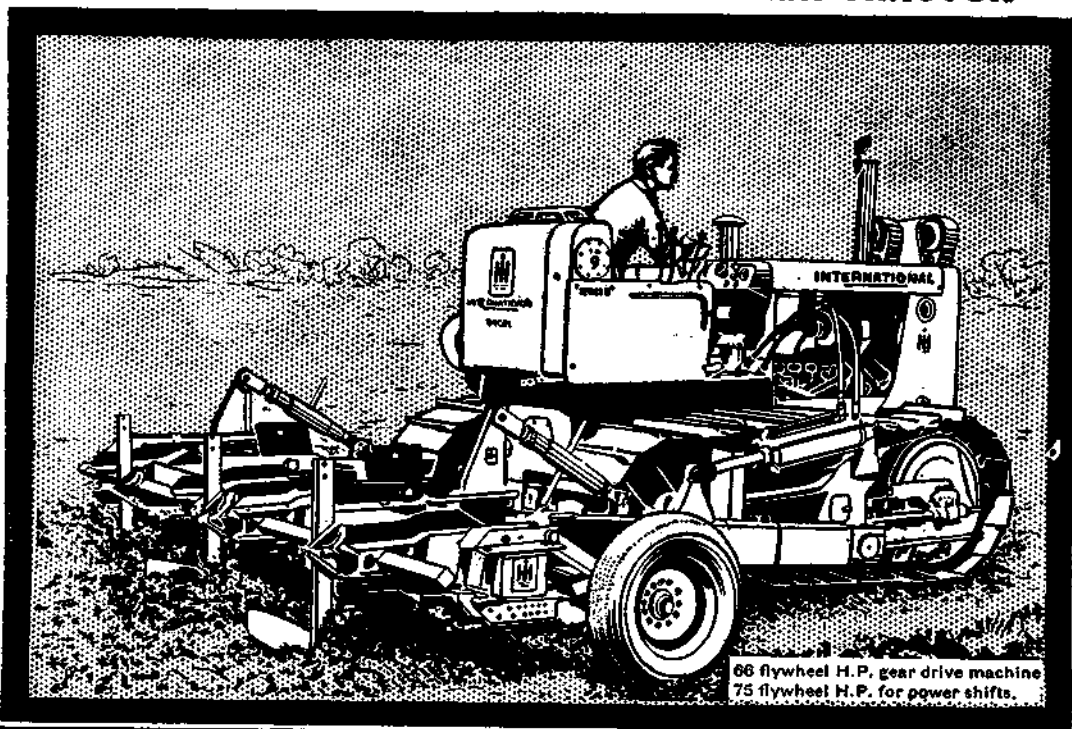
To help the dairy farmers, the Project has constructed three dairy worksheds in the interior areas where 150 milkmen (members of three cooperative societies) avail themselves of the equipment for preparing cream, butter and other milk products, at nominal charges. Loans totalling Rs. 45,600 have been advanced to various dairy farming units during 1963-66, 24 of whom owe their existence to the project help. Three poultry units—there are 10 in all—received a loan assistance of Rs. 3,400 while 18 pine-apple cultivation units—nine came up through project efforts—accounted for financial assistance of Rs. 25,100.

FLOWERS EARN FOREIGN-EXCHANGE

Floriculture is a big business in Kalimpong; there are at least half-a-dozen big nurseries which produce cut flowers, mostly for home market, and seeds and bulbs, both for home and foreign markets, valued at over Rs. 2.5 lakh a year. They are reported to be earning Rs. one lakh in foreign exchange every year. The project has helped 10 floricultural units by advancing loans totalling Rs. 44,000 during the last three years. It has also started a training centre for imparting instruction on scientific lines but the centre has yet to go a long way in coming up to expectations. The same is the case with the training centre in bristle dressing at Bijenbari which has trained no fewer than 25 persons, mostly women, in bristle dressing by granting stipends of Rs. 30 per month to each trainee for a year, but has not succeeded in raising the earning of ex-trainees, 15 of whom are members of a cooperative society, above Rs. 1-1.50 a day. Bristles have a ready export market and the stuff of this area, being the best in the country, fetches better price. Establishment of eight new bristle dressing units with project assistance is a welcome development, yet there is need to give more thought to fuller exploitation of this local resource by encouraging one or two units for the manufacture of shoe and paint brushes.

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Designed to handle 200,000 litres of milk a day, this Dairy will cater to the twin cities of

Hyderabad and Secunderabad. Part of a large integrated milk project of Andhra Pradesh, it will serve a dual purpose. Pasteurised milk will be available to more people, and the Co-operative farmer will have a ready market for his produce throughout the year.

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