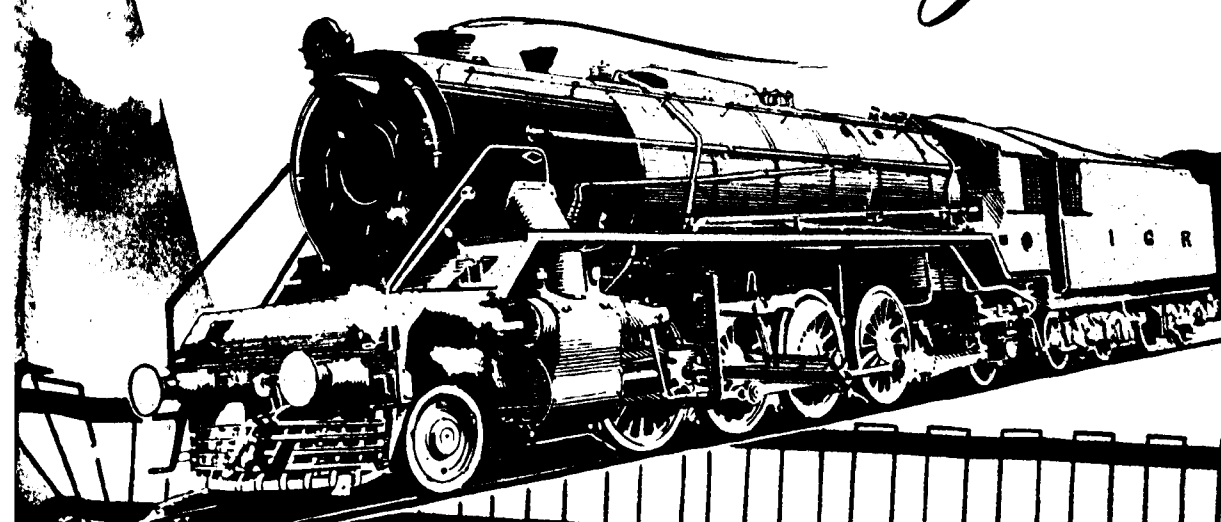


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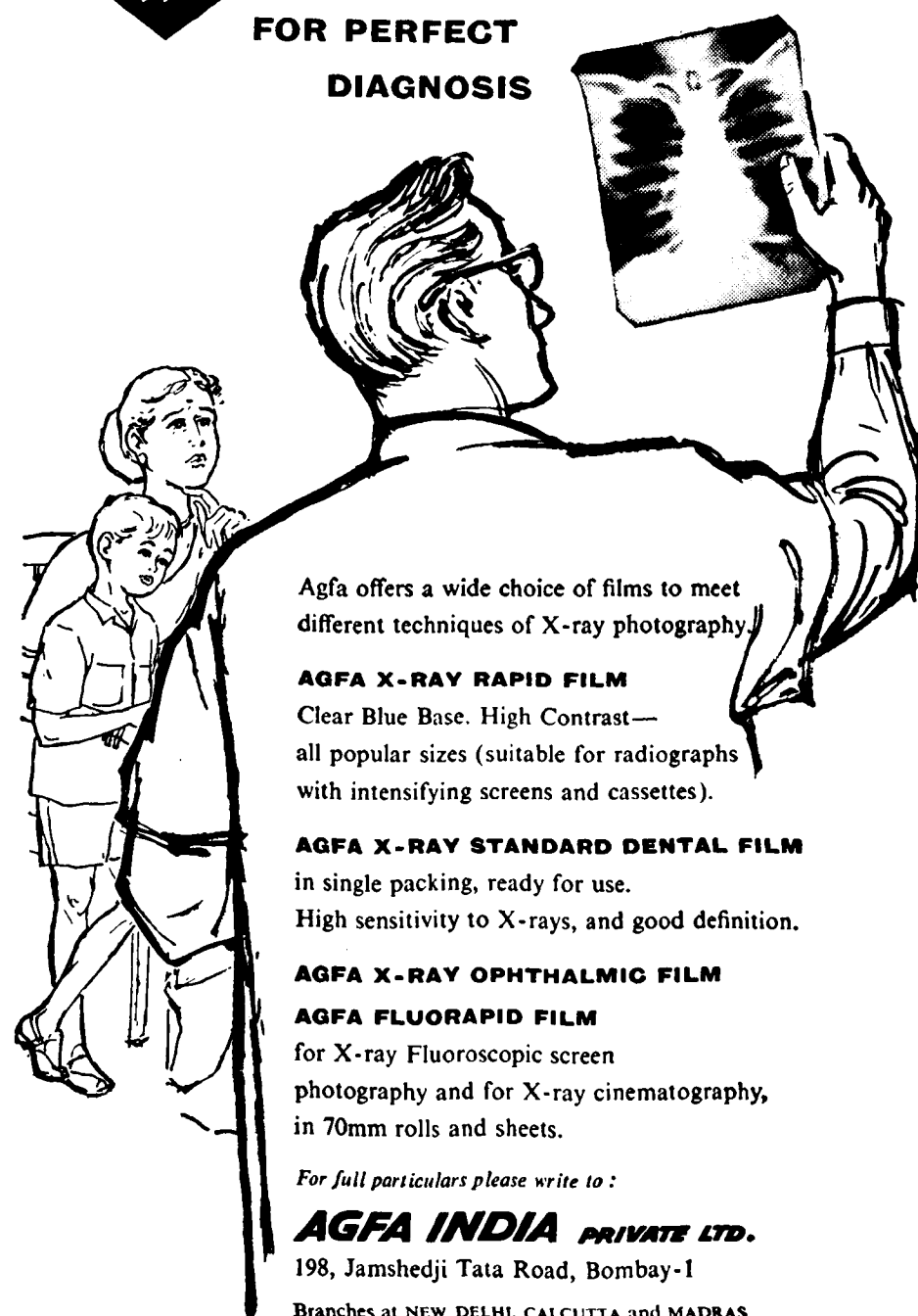
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INDIAN RAILWAYS HOSPITALS ANNUAL

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SOUTHERN RAILWAYS MAGAZINE

H.S.3

Effect of Mouth Breathing on Oral and Dental Tissues

By Dr. O. P. Saxena, B.Sc., B.D.S.
Dentist, Central Hospital, North Eastern Railway, Gorakhpur.

THE habit is more commonly found in children. It may be habitual or obstructive type. The later may be due to an increased resistance to, or a complete obstruction of the normal flow of air through the nasal cavities. The child is forced by sheer necessity to breath through his mouth.

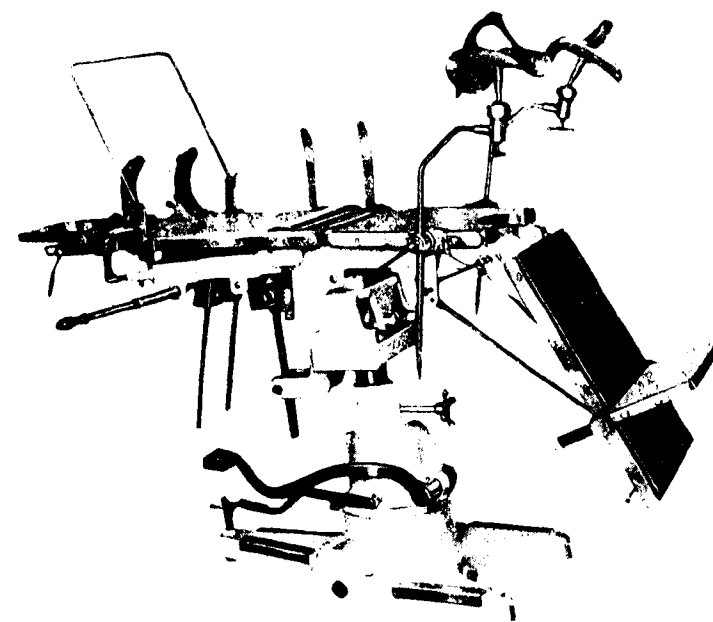
The habitual mouth breather is a child who continually breathes through his mouth by force of habit, even though the nasal obstruction has been removed. Obstructive mouth breathing is frequently observed in ectomorphic children who possess long, narrow face and small nasopharyngeal spaces. Because of the genetic type of tapering face and nasopharynx these children are more prone to have nasal obstruction and those with wide nasopharyngeal spaces, such as are found in brachycephalic individuals.

Resistance to breathing through the nose may be prompted by the following reasons :—

- (1) Affictions of the mucous membrane lining the nasal passages, atrophic rhinitis or oedema, hot and dry climatic conditions or polluted air.
- (2) Deviated nasal septum with blocking of the nasal passage.
- (3) *Enlarged adenoids.*

Since adenoidal or pharyngeal, tonsillar tissue is physiologically hyperplastic during childhood, mouth breathing from this cause in young children is not unusual. However, the mouth breathing may be self-correcting as the child grows older and as the natural

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physiologic process causes the adenoidal tissue to shrink.

Mouth breathers as a rule have a typical appearance which has been described as adenoid facies. In fact, it has not yet been proven that mouth breathing causes the facies. In cases with adenoid facies, the face is narrow, the upper anterior teeth protrude labially, and the lips remain open with the lower lip extending behind the upper incisors. Because of the lack of normal muscular stimulation from the tongue and owing to the increased pressure on the cuspid and primary molar areas by the strained orbicularis oris muscle, the buccal segments of the maxilla collapse, giving a V-shaped maxilla and a high palatal vault. The habit once formed is hard to break. In such cases, however, it is essential to ensure proper nasal breathing. In cases where Patients keep the lips apart the nasal cavity must be examined and the obstruction removed. Many patients persist in the habit of mouth breathing even when a free nasal passage has been obtained.

Nasal obstruction arising from the presence of adenoids greatly influences the growth of the maxilla. The adverse effects produced depend largely on the period of onset of the habit. In a child, who has suffered or is suffering from enlarged adenoids the teeth will be crowded and the muco-periosteum of the palate will present a somewhat puckered appearance. In transverse section, it will be dome-shaped, and in longitudinal section will rise somewhat abruptly from the posterior aspect of the incisors, the palate will have the appearance of having been pushed up towards the front.

While actual breathing through the mouth and no through the nose is uncommon except during periods of nasal catarrh, many children are labelled as mouth breathers, because they hold their lips apart for long periods of time and apparently only close their mouths to swallow. In some children protrusion of the upper teeth makes closure of the lips impossible. In others no obvious obstruction is present and no obvious reason for holding the lips apart is apparent, but it may be due to a habit, a posture, inadequate tissue or a poor muscle tonus. Children will often hold their mouth open while watching something intently, but few actually breath through the mouth.

The gingivæ, however, become air dried and the constant wetting and drying constitutes an irritation to

the gingival tissues. Saliva about the exposed gingivæ becomes viscous, debris collects on the gingival surface as well as on the surface of the teeth, and the bacterial population becomes enormously increased.

In a mouth that is functional, the constant friction of efficient mastication and the friction of mucous membrane of the cheeks and lips against the gum margins in a healthy condition. Abnormal conditions, such as mouth breathing and functionless teeth, lead to the accumulation of food debris, etc., at the gingival margin. The material thus lodged undergoes fermentative and putrefactive changes. In the soft tissues an inflammatory reaction follows, such a condition is well marked in mouth breathers. If the mouth of a child, suffering from nasal obstruction be examined, a marginal gingivitis will be found around the anterior maxillary and mandibular teeth. This anterior marginal gingivitis in a child is almost pathognomonic of mouth breathing, while the gingival margin at the posterior part of the mouth will be found quite healthy provided that the function of mastication is properly performed. In a mouth breather the natural function of the lips against the gums is to a great extent absent with the result that the debris around the teeth is not removed which gives rise to irritation and injury to the gingival margin. Whenever the patient is unable to breath properly through the nose, it causes the gingivæ to become inflamed and haemorrhagic.

Inflammation of the gingival sulcus is a subacute or chronic process which is confined to the superficial soft tissue. If left untreated it gradually involves the deeper structures and periodontitis develops.

In mild cases the labial gingivæ merely become inflamed but in severe cases it becomes hyperplastic in the cuspid to cuspid region. The incidence is much higher in children with dirty mouths. The hyperplasia occurs for the most in the anterior part of the mouth when the air strikes first and is of a distinctive lobulated type.

A persistent gingivitis of the anterior region, predisposes the teeth to caries and paradontal disease especially the incisors. A functional mouth is essential if caries is to be prevented. Tender teeth hinder mastication, and without proper mastication the natural cleansing of the teeth and nourishment of the child is interfered with. The oral deformities and mal-arrangement of teeth in case of a mouth breather are very typical.



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Some Random Thoughts on Hospital Planning

By S. J. Malhotra, M.R.C.P. (Lond.), D.P.H. (Lond.) D.C.H. (Eng.), D.I.H. (Eng.)
Chief Medical Officer, Northeast Frontier Railway

“ The Medical profession has been almost wholly occupied with the diagnosis and treatment of disease ; it has built palaces of disease called hospitals and it has trained generation after generation of students in such a way that a healthy person only comes under their observation more or less accidentally” . --PROFESSOR VINES

THE problem of Hospital planning in our country presents several interesting facets. First of all, it is not generally realised that a modern hospital is an expensive institution both to erect and to maintain and there is no room in it for mediocrity.

There are many planners who feel that more emphasis should be placed on the dispensaries or the Health Units than on the Hospital—namely on what they call the periphery. They feel that improvement should start at “the periphery” and therefore, quite mistakenly they have visualised large and expensive structures as Health Units. Frankly speaking, I cannot agree with this point of view. I think our economic condition and the pressing needs of our policy of rapid industrialisation, cannot at the present time permit us the luxury of elaborate, large and expensive buildings and staff set-ups at the dispensary or Health Unit level. We must, therefore, really concentrate on our Hospitals at present. The dispensaries are expected to provide the general practitioner or family physician services both in the curative as well as the preventive fields and it is, therefore, quite unnecessary to provide elaborately designed and expensive structures for these dispensaries.

In the case of Hospitals on the other hand, some people feel that we should go in for cheap, mediocre buildings and not waste money on elaborate structures. As I have previously said, hospitals are costly to erect and costly to maintain, although, unfortunately many people regard these costs as so much money gone down the drain. It is often forgotten that an efficient Hospital makes a very useful and practical return on its costs in the form of man-days saved to the national economy alleviation of human suffering and other less tangible things. It is a pity that not even our Financial Advisers have tried to assess the relative value of a sick mother quickly returned in good health to her working husband and their children and a sick F. A. & C. A. O. returned to his office. It is in the Hospital that the edge of medicine is sharpened : it is there that the art

of healing brings its greatest benefits to the patient : it is there that the community is served in crisis of serious ill-health.

The Hospitals of this country on the whole are in a very poor state ; their fabric is old, they are often unsuited to the demands of modern treatments as they are never planned for them, and they are mostly a mass of improvisations, more or less inefficient and uneconomic, wherever an attempt is made to adopt them to present day uses. Worst of all, we have grown used to them, just as a man gets used to a chronic illness which slowly saps, his vigour and energy.

On the Railways, not a small number of our Hospitals are improvised structures—improvised from old school, office or residential buildings, with a room added here or a ward added there. Clearly, with this hotch potch we need extensive building programmes for new and modern Hospitals. But thanks to the devotion of those who somehow make these dilapidated & unsuitable buildings work, that the standard of our medical aid is quite good.

Hospital architects are always in a difficult position. I wish they had had opportunities to see the work of doctors & nurses for a few weeks and certainly of being patients in the buildings they design, so that they can really see where the weaknesses of their designs lie.

THE ELEMENTS OF THE HOSPITALS

Broadly speaking the Hospital has three elements :— the patient, the building and the staff. Its greatness depends not so much on the brick & mortar as on the staff who work in it. But the brick and mortar is important—in fact, very important & must provide for all the facilities for good patients-care.

THE SIZE OF THE HOSPITAL

There are various views held about the size of the

AKV-AKV

In the Easter Island in the Pacific, they attribute aku-aku to a person who, they think, has a magical spirit superior to their own. Other primitive regions also have their own synonyms of the term.

More often than not, this superior magical spirit is attributed to the witch doctor or medicine man. Records of primitive societies are strewn with instances of belief in the superior magical powers of the medicine man who usually practises his art with a flourish of ostentatious rituals.



Modern societies have travelled a long way from the bizarre mumbo-jumbo of medicine men to white-clad doctors, nurses and hospital staff and most important of all, the pharmaceutical industry which produces medicine under strict scientific specifications. Progress in the manufacture of medicine is, in this sense, a measure of the general progress of the country.



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* Mysterious stone sculpture of Easter Island

Hospital. One is to have large Hospitals with say 800 to 2000 beds. The other is to have medium size Hospitals with 400—500 beds. Probably it is not incorrect to say that a Hospital of less than 200 beds, supplying needs for general surgery, general medicine, obstetrics, gynæcology, pediatrics, cardiology, pathology & radiology would be uneconomic.

We use a yardstick of 5 beds per 1000 employees or one bed per 1000 population. This yardstick would be doubled during the III Plan Period to 2 beds per 1000 population. I do'nt think that even that would meet the situation. The Hospital Council for greater New York has arrived at a figure of 16 beds per 1000 of population for that city where the incidence of illness is naturally much smaller than ours as Tropical and many other diseases do not pose a problem there. I have no doubt that in the years to come there will be greater awariness for the need for beds and we would have at least 10 & eventually 15 beds per 1000 population. For the Railways where the population is scattered, it is my belief that there should be two kinds of Hospitals; smaller Hospitals more diffusely scattered and a few large Hospitals at strategic points. The smaller Hospitals should have 35—60 beds and the large Hospitals from 100—300 beds. The smaller Hospitals should have a resident staff of general practitioners (Assistant Surgeons) with visiting consultants but the large Hospitals must have full-fledged consultant departments. There is no agreement on the ward size. In the newer American & Scandinavian Hospitals the four bed sick room is the maximum size. I doubt if this would suit us as it would need heavy nursing staff. Perhaps 8 bed sick room would be reasonable. Another staff saving ward unit would be a large ward of 32 beds with four-eight-bed-sick rooms with a central corridor & shoulder-height opaque-cum-transparent partitions. Our proposal H. Q. Hospital at Maligaon makes use of this concept in principle. In addition to the 8 bed sick rooms, there is a definite need for single rooms & it is generally agreed that these should make up about 20—25% of the total beds. These beds are necessary for the gravely ill, the dying, the noisy & those other needing privacy.

Each ward unit must have an adequate number of ancilliary rooms such as patients lavatories & baths, nurses' duty room with a w. c. & wash basin, doctors room with a w. c. & wash basin, ward side-room for clinical pathology, store room for dirty and clean linen treatment room for sterilisation and dressing etc., especially those which are painful; patients' interview room where patients can have private conversations with

their relatives; a spare room where visitors in serious cases can stay for the night and a recreation or sitting room for patients to encourage early ambulation and a patients' library. In maternity wards one must not forget the baby's napkin room for drying the napkins & a sanitary pad incinerator in the w. c. area, to dispose of the sanitary napkins. The patients lavatories & baths must be on a liberal scale and must have wide doors so that wheel chair can be easily wheeled into them. This is because of the emphasis on early ambulation and the general recognition of the fact that being in bed is not the sole object of the patient in the ward area, in fact, the whole object of the place is to get him out of bed and keep him out. Also because the bed pan is now being universally condemned. I have seen one very common defect in Hospital lavatories. These have short walls so that the sense of complete privacy is lacking. It is wrong to economic in such matters. The Wards and the patients' recreating rooms should have pleasant decorations and above all there should be a library and playing cards and other indoor games, provided in the recreation room.

THE SPECIAL INPATIENT SERVICES

Whatever the size of the Hospital, there will be need to build some special types of wards such as for children, for patients with acute infectious fevers, for acute mental cases and perhaps for other groups of patients such as the executives and officers.

Children's wards should be small so that in case of an infectious disease occurring in one ward, the others need not be closed. A childrens nursery-cum-play room is necessary as an addition to the usual ancilliary rooms. This should be appropriately decorated and fitted for childrens' play and education, as childrens' education may have to be carried on, especially during prolonged illness.

Every general Hospital should have one or two rooms for the psychiatric ailments to admit mentally ill patients in case of psychiatric emergencies.

PATIENTS' FOOD

Patients' food needs a lot of reform. It is my experience that Hospital food is generally monotonous, insufficient and not unoften badly cooked and usually badly served.

Patients' food must be served hot from heated trolleys and I think there is much to commend the

British practice of taking the food trolley round to the beds, giving the patient a more personal service and allowing him to choose what and how much he wants to eat. Economising on the quality and quantity of patients' food is to be deplored and should be strongly opposed. The question of siting the kitchen in single storey Hospitals does not present any great problem. It should have good light and ventilation and should be so sited that smells are prevented from penetrating the Hospital building. In the multistorey Hospital, these objects can be achieved by siting the kitchen on the top floor although this has the disadvantage of additional labour involved in unloading and carrying the raw materials and stores at the top. Food lifts for such a kitchen are a necessity.

What is more important is that the kitchen should have ample space, an ample store room, a refrigerator and a deep freeze for meat and fish and above all a sufficient number of wash-hand basins with an ample supply of liquid soap.

It is common knowledge that food gets contaminated in two ways and both of them can be prevented by washing hands. It is revolting but I have seen it in kitchens that personal hygiene amongst kitchen staff is often lacking, first by failing to wash the hands after using the W. C. and second by clearing the nose and wiping it with the fingers and the back of the hands. The major contributory factors are lack of washing facilities and the uneducated habits of personal hygiene. There must be at least 3 sets of wash hand basins in the kitchen—one in the W. C. area meant for the kitchen staff, one outside the kitchen and one in the kitchen itself.

The provision of so much plumbing would no doubt be expensive, but architects should understand the vital nature of the problem and insist on these proper facilities even in the face of opposition.

OUTPATIENTS DEPARTMENT

In a Hospital, the indoor section tends to get the lion's share. I think, in our Hospitals where these do not have a consultant status as yet the outpatients services must assume greater responsibility and provide several general and special clinics. In a large Hospital there would be need for the following clinics: the casualty department, general medicine, general surgery obstetrics & gynaecology; the special clinics of cardiology, neurology, paediatrics, dentistry, disease of Ear, Nose & Throat, Diseases of the Eyes, Chest clinic, Venereal diseases and skin clinic etc.

In smaller Hospitals, the no. of such clinics will naturally have to be less. As I have already suggested that on the Railways, there is need for smaller Hospitals more defusely scattered & a few large Hospitals at strategic points. I think in the large Hospitals we must have all these departments and in the smaller ones only general surgery, general medicine, maternity & child welfare and perhaps casualty. Of course in the smaller Hospitals there must be a system of visiting consultants who would be attached to a group of such Hospitals and would visit each turn by turn on fixed days of the week.

The siting and entrances to these various departments in the outpatients is an important matter. It is a common practice in larger Hospitals to bring all outpatients into the building through a single entrance where they are directed by the receptionist to their destinations. To facilitate this, many Hospitals have different coloured pointers painted all the way on the walls of the varandahs or the corridors.

In the reception hall there should be provided a refreshment bar, a waiting roof for relatives and lavatory accommodations for men and women. The waiting room for relatives should be suitably decorated and should have a few magazines for the benefit of these who wait.

Individual clinics should have their own waiting rooms for patients.

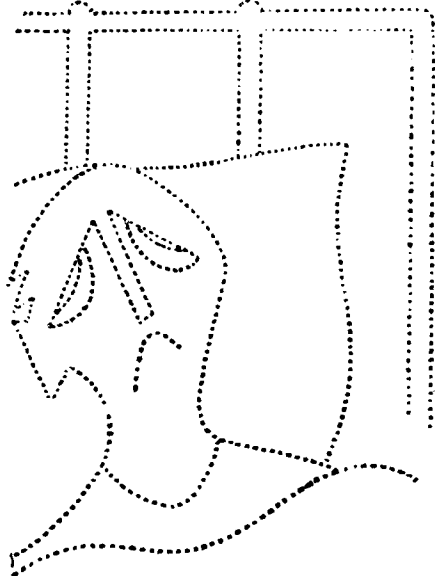
As regards entrances, the casualty should have two entrances—one for ambulance cases and one for walking cases. The chest clinic should have a separate entrance, as far as possible, as T. B. cases are potentially dangerous and as far as practicable should not mingle with others. The clinics for general medicine and general surgery will naturally have the largest attendance and, therefore, should be situated on the ground floor and as close to the reception as possible to avoid much walking.

ANCILLIARY MEDICAL SERVICES

The ancilliary services such as pharmacy, pathology X-rays and physiotherapy are important equally to the inpatients as well as the outpatients. Their correct siting is, therefore, of considerable importance.

(1) *Pharmacy*

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needs for pharmacy will be decentralised in the wards, where the nurses' duty room will deal with these & the stock mixtures. For the outpatient needs a sufficient number of dispensing windows depending upon the outpatients' attendance should be provided. Along side the pharmacy department, there should be a dressing room & a room for giving injections, both fitted with sterilizers and above all an ample central drug store room.

(II) Pathology

The pathology department should have good light and ample space. Usually this department tends to get cramped. This department like the X-ray, has to deal with the inpatients, the outpatients and also patients sent from out-stations. It is now being generally realised that the principle of decentralisation should be applied to both the pathology and the X-Ray departments. In the older Hospitals we used to have what was termed the Clinical side room. Here the routine clinical pathology namely urine, stools, sputum and blood studies were undertaken by the house staff. I think there is an urgent need to revive this 'Clinical side room' to relieve pressure of routine work from the pathology department.

(III) X-Rays

This is another of the Hospital departments which is usually over-worked for obvious reasons. Pressure on it can be relieved by decentralising the work. A small plant in the orthopaedic clinic & another in the chest clinic can do a lot to relieve the pressure of work.

(IV) The laundry

Laundry is a great problem in our Hospitals. The usual method is to get the linen washed from dhobies on contract. This method is essentially unsatisfactory. There is a lot to be said in favour of a mechanised laundry. It is efficient compact and economical. The linen of the smaller Hospitals can be serviced at the group laundry serving a number of these Hospitals.

THE LECTURE HALL

An acute general Hospital has at least four functions: First & foremost, its duty towards the patient, involving the professional care of the sick, secondly its duty to educate almost all who have to do with it along various lines involving continued education and refresher courses for the Hospital staff, doctors,

nurses, dressers, attendants etc., thirdly its duty towards science involving investigation of the causes and treatment of diseases; fourthly its duty to the community in the prevention of disease.

Unfortunately, all these functions are not sufficiently developed in our Hospitals at present. This paper is not the thesis to dwell or lament the lack of preventive functions in the modern Hospital. I am sure in the next 50 years the emphasis will be more on prevention than on cure.

But I feel rather, strongly about the absence from our Hospitals of a very useful feature—the lecture room. It would do us no harm to remind ourselves, repeatedly, if necessary that the greatness of a Hospital lies not in its brick and mortar but in the men who work in it. Medicine is an advancing science and, therefore, the continued education of its staff is absolutely essential. A lecture hall where clinical staff meetings and lectures for the doctors, occasional refresher courses and lectures for doctors, occasional refresher courses and lectures for nurses and auxiliary staff can be held is, I feel, a necessity. The lecture hall can also be used for talks on health education and family planning.

To fulfil the object of the continued education of the Hospital staff a library of technical books in association with the lecture hall is very necessary and careful thought should be devoted to the collection of technical books and journals for the library.

I have said very little about the Hospital staff. It is a great pity indeed that the doctor and the nurse are not given much the same advantages as they could obtain elsewhere had they dropped out of these professions. The poor salaries as compared to other vocations, the poor prospects of promotion & insufficient financial incentives for the medical and nursing professions, it is hoped, would engage increasing attention of the planners of medical services in the future.

It is hard going on the road of medicine. As Sir Andrew Clark used to say that he had striven ten years for bread, ten years for bread & butter and twenty years for cakes & ale. Despite the long journey, few people realise the hardships of the medical profession.

Very few persons who have not been ill realise the benefits of a Hospital and a medical service to the community. A per capita expenditure of 5—6 rupees per annum is frowned upon as extra-vagance. Those

who do so will do well to remember that the British National Health Service costs 400 million pounds a year & represents one sixth part of the national expenditure or 140 rupees per annum per head.

The Central Council of Health has recently recommended to the Planning Commission that not less than 10% of the total Third Plan outlay should be earmarked for health. Even then, undoubtedly we have yet a long way to go.

I hope all the same, that the Hospital of the future will be kind & magnanimous and ever ready to help those who are in need of it. It would create a feeling, not of toleration mixed with awe or disgust, but of affection & friendliness, a place where kindly help and advice would be always available and which would make one feel that being ill is not so very terrible after all.

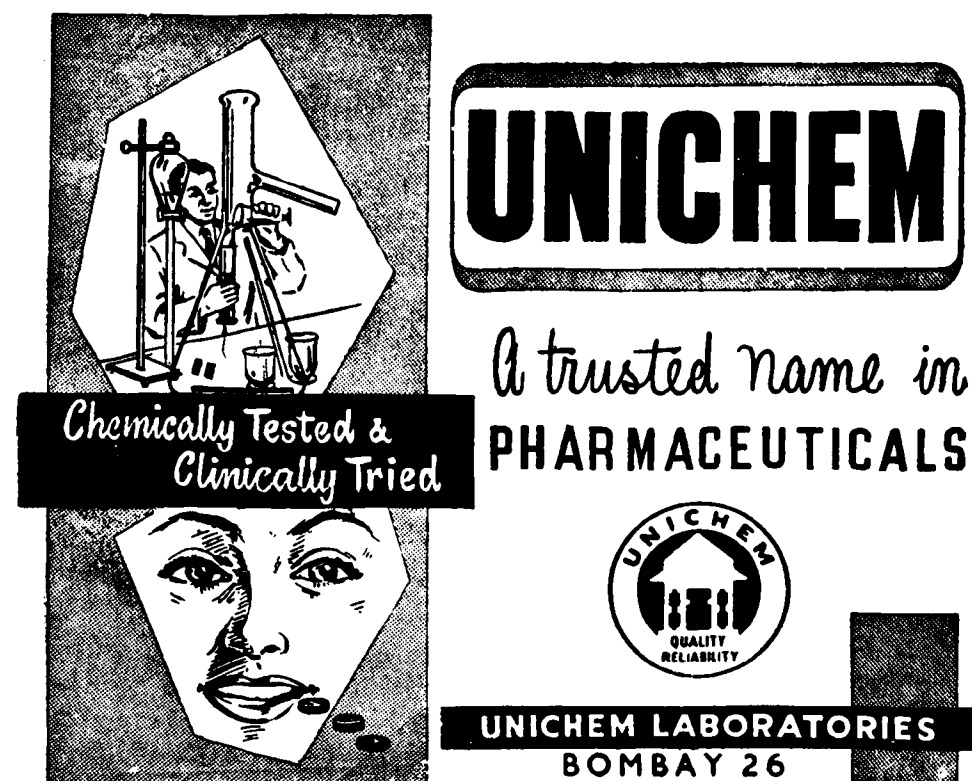
(Note: In preparing this paper, I have freely and gratefully drawn on Professor Vines work on Hospital planning).

Small AC and Universal Electric Motors

The Indian Standards Institution has recently published IS : 996-1959 Specification for Small AC and Universal Electric Motors with Class 'A' Insulation, which applies to small single-phase motors of the capacitor, split-phase, repulsion-induction and universal types and small three-phase induction motors of the squirrel cage rotor type, having a rated output of 0.75 kW per 1000 rpm (synchronous) or less and having windings with class 'A' insulation as defined in IS : 1271-1958. Small motors of the shaded pole type

are not included in this specification as it is intended to cover them, in due course, in specifications for motor-driven domestic electrical appliances.

The standard also specifies important dimensions of three frame sizes of motors with rigid base or resilient mounting. The dimensions specified are those necessary to ensure that motors of different makes, conforming to this standard will be mechanically interchangeable for all normal applications when mounted on the driven machines.



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MALARIA has been man's worst enemy for centuries, the worst sufferers being those living in the tropical and sub-tropical countries. The estimated number of malaria cases seven years ago was 350 million with 3.5 million deaths. In 1957 the estimate was 200 million cases with 2 million deaths. This shows a considerable retreat of the disease and the possibility of tackling world-wide eradication with some degree of confidence.

In India, before 1947, it was estimated that nearly 100 million people fell prey to malaria every year and over a million of these died. With partition of the country in 1947 the estimated malaria cases were reduced to 75 million and 8 lakh deaths annually. The total estimated loss on various scores such as loss of agricultural and industrial output, loss of wages etc. in 1947 was Rs. 1,100 crores.

In 1953, the National Malaria Control Programme was launched by the Government of India as a part of the health development side of the First Five Year Plan. The programme was launched with the assistance of international agencies like the United States Technical Cooperation Administration, the U. N. I. C. E. F., the W. H. O. and the Rockefeller Foundation. Designed to afford protection to 125 out of 200 million people exposed to the risk of Malaria the programme was to cost Rs. 15 crores for three years ending 1955—56.

In 1953—54, 84 malaria control units were established protecting 52.77 million population. In 1954—55, the number of units was 110.75 and the population protected rose to 79.89 million. In 1955—56, with the establishment of another 26 units the total number of units functioning were 134.25 and population protected by them 111.69 million. The number of units rose in 1956—57 to 169.25 million and population protected to 145.25 million.

By the end of the First Plan period, the National Malaria Control Programme had achieved the following :

(a) The malaria morbidity was nearly halved.

(b) Large tracts of fertile land were made cultivable in various parts of the country.

(c) Consequent to malaria control operations greater manpower was available to tend agricultural operations benefiting economically both the land owners and the labourers through increased wages and output.

(d) A DDT manufacturing plant was established at Delhi.

(e) At the time of the inception of the plan there was no agency in our country to manufacture standard spraying equipment and all this had to be imported. In the course of two years the industry became self-sufficient to produce standard equipment.

(f) Training in malariology was imparted to 80 medical officers, 13 entomologists, 430 malaria inspectors and 30 technicians to meet the growing need for trained personnel.

Consequent to sizeable and universally felt advantages during the first three years of control operations, in 1955 it was decided that the National Malaria Control Programme activities be intensified and continued in the Second Five Year Plan period.

A sum of Rs. 27 crores was provided for malaria control operations on the basis of the 5-year operational period. The plan provided for raising the number of control units to 200 so that the 200 million people living in the malarious areas be afforded protection.

However, the experiences of large scale malaria control programmes in malarious areas of different parts of the world necessitated a reorientation of current policies.

The first factor responsible was knowledge gained about disappearance of malaria parasite in the human host in population which had been effectively protected against new infection for a period of at least three years. The second factor was the demonstration of the phenomena of resistance which malaria carrying mosquitoes in some areas developed against the insecti-

cide in use. While the first factor demonstrated the possibilities of eradicating the disease the second factor stressed the urgency of action.

FROM CONTROL TO ERADICATION

The change in concept from Malaria control to eradication was first discussed in 1948 at the 4th International Congress of Tropical Medicine and Malaria and later during the Second Asian Malaria Conference of the W. H. O. held in the Philippines in 1954.

The Eighth World Health Assembly in 1955 passed a resolution which inter-alia requested the member Governments to intensify plan of nationwide malaria control so that malaria eradication may be achieved and the regular insecticide campaign safely terminated before the potential danger of development of resistance to insecticides in anopheline vector species materialises.

The National Malaria Eradication Programme was launched in India from April, 1958, and was designed to protect 390 million people living in various parts of the country irrespective of the degree of malariousness to which they were exposed. The objective of the programme is to achieve eradication of malaria by the end of the Third Plan period.

The eradication programme consists of an attack phase during which every roofed structure will be sprayed with DDT for a minimum period of three years once or twice a year; a surveillance phase during which all residual cases of human infection will be detected and given effective radical treatment; the last phase will be maintenance with a strict watch to take prompt action if there is a suspected case of malaria with a view to eliminating it.

Under the eradication programme the number of units functioning in 1958—59 was 225.25 and in 1959—60 the number was 386.75, protecting 214.15 and 340.2 million population respectively.

IMPRESSIVE RESULTS

During the past five years the child spleen rates have

dropped from 20.3 to 0.2; child parasite rate from 3.8 to 0.04 and infant parasite rate from 12.9 to 0.02 over the country as a whole.

The dispensary statistics of all diseases compared to malaria cases also show interesting results. Compared to 60,73,337 cases recorded in 1953—54, the number of cases in 1959—60, up to October 1959, was only 11,58,803 (for 11 States only).

The number of persons trained so far as malaria medical officers, malaria inspectors, malaria engineers and laboratory technicians has been respectively 1701, 1177, 262 and 184.

The total outlay for the Second Plan period is Rs 5,572.60 lakhs (Rs. 1,215.52 lakhs for control programme for two years 1956—57 and 1957—58 and the balance for three years of the eradication programme). Assistance received from international agencies during the Second Plan period is U. S. Technical Cooperation Mission Rs. 3,005.61 lakhs, (Rs. 647.04 lakhs for control programme for two years and balance for three years of the eradication programme), while W. H. O. has given a sum of Rs. 103.45 lakhs. The proposed out-lay for the Third Plan period is Rs. 5,837.58 lakhs.

From 1959—60 some of the States have gone to the next stage of the eradication programme i.e. passive surveillance. In Mysore the experimental surveillance has been operative for over 1½ years involving a population of 1.5 million.

However, before the new phase of surveillance begins much would depend on the cooperation that the programme receives from the public, not only in the matter of allowing their houses to be sprayed with DDT but also by way of reporting all fever cases and getting their blood examined and taking proper treatment.

No project of this magnitude which so intimately affects the lives of million can succeed without the willing, intelligent and unstinted support of the public at all levels.

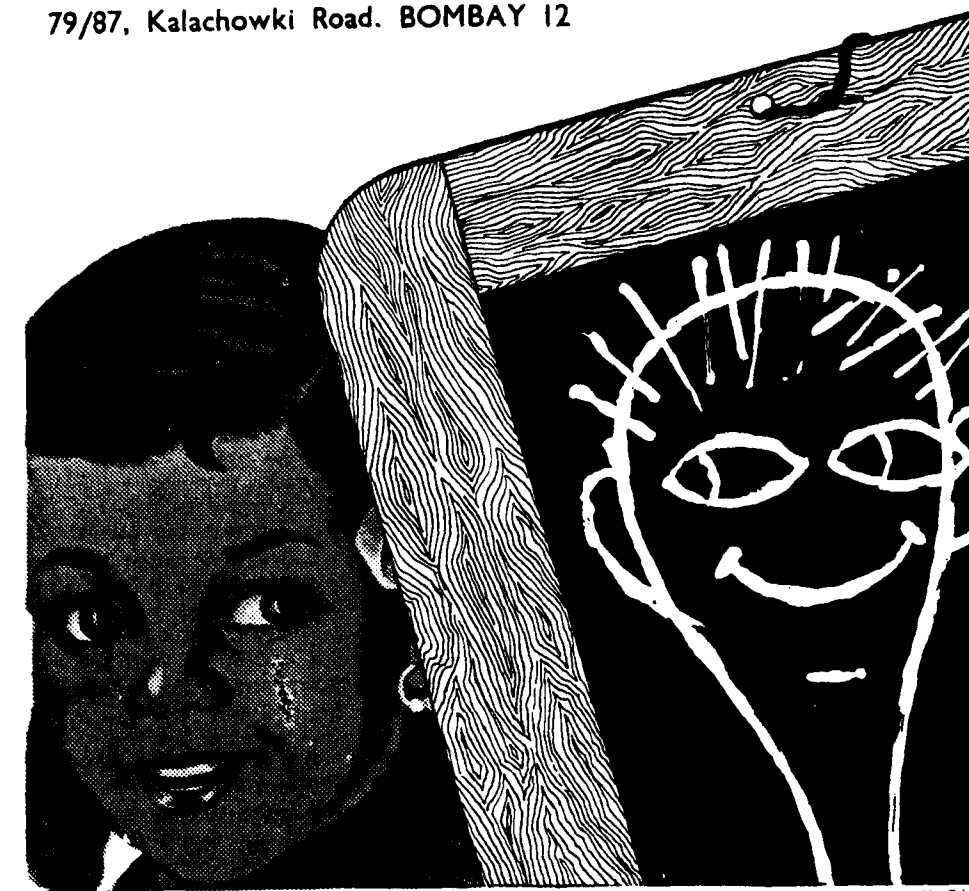
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Health Service and Position of Doctors in USSR

By K. Suchkova

Chairman of the Moscow Regional Committee of
Medical Workers' Trade Union.

A CONSIDERABLE improvement in the Soviet people's health has been achieved, thanks to the constant improvement of material conditions and standards of education, to the successes achieved in the field of public health protection and to the fact that we have a free medical service available to everyone. Prior to the Great October Revolution the death rate per 1,000 of the population was 30.2 and under Soviet power it has dropped to less than one-fourth. Child mortality has fallen to about one-seventh of the old figure and the average expectation of life has more than doubled.

Whereas in 1914 there were only 23,143 doctors in what is now the U.S.S.R., and about 50,000 nurses, etc., today the country has 380,000 doctors and 1,300,000 medical workers with secondary education. The Soviet Union has about one-third of all the doctors in the world. These figures alone are enough to show what titanic efforts are made in the country to look after the people's health.

This is true of every republic, territory or region. Take the Moscow Region for instance. Whereas in 1913 it had some 400 doctors, now the number has grown to 11,243; all told, about 100,000 medical and pharmaceutical personnel now work in the Region (excluding the city of Moscow).

Having made another considerable reduction in its armed forces, the country is allocating a large part of the money saved to improving the people's well-being still more; much of it is going to the medical services.

Our target for the Seven-Year-Plan is to bring the number of doctors to approximately 21.7 per 10,000 of the population. In no other country is the proportion so high. The network of medical establishments will be considerably enlarged and their equipment modernized.

MEDICAL WORKERS' WELL-BEING

The constant solicitude displayed by the state for public health goes hand in hand with concern to constantly increase the material well-being of the

medical workers and improve their working and living conditions.

Depending upon their speciality, hospital doctors work from 5 to 6½ hours; those working with X-rays, or at establishments specialising in infectious diseases, psychiatry and TB get extra payments amounting to between 15 and 30 per cent of their wages.

Medical workers are intitled to annual vacations lasting from 24 to 48 working days, also depending upon work.

"The Soviet doctor is a figure of state importance, who is paid for his work by the state," Nikolai Semashko, the first People's Commissar for Public Health, used to say. "He is a servant of the people and naturally this determines his behaviour with regard to the collective, with regard to the people in general."

In their everyday work Soviet doctors remain true to the finest traditions of their profession.

Residents of the village of Kokhb in Armenia conferred Doctor Nasibian's name on a hospital he had set up there. On December night, when snow had blocked all the mountain passes and the roads were so slippery that neither horse nor man could travel on them, Dr. Nasibian, himself unwell, set out to examine a sick girl.

He saved her, but was taken seriously ill and died. He lost his life like a soldier, wresting another person's life from the clutches of Death, and the words written on his monument seem to be coming from the very depths of his countrymen's hearts: "People, love and respect this noble man. He loved and respected people greatly".

PUBLIC HEALTH

During the years of the Great Patriotic War thousands of Soviet doctors added unforgettable pages to the history of the medical profession. For their heroism many of them received the honorary title of Hero of the Soviet Union. Quite recently a large

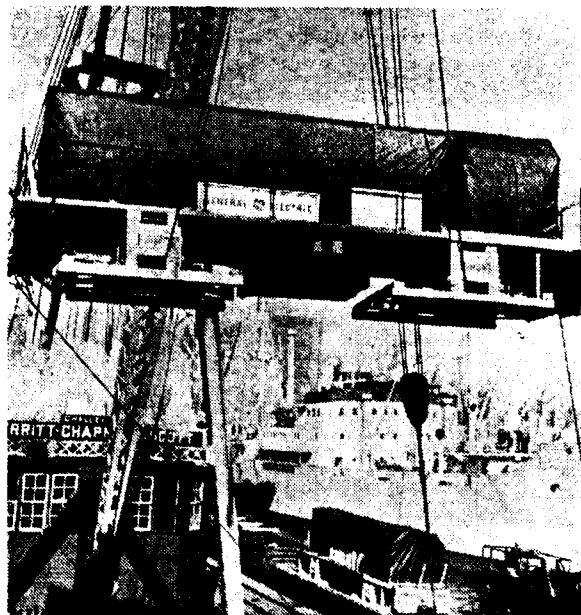
group of Soviet women doctors were awarded government orders and medals.

All measures for improving public health services are carried out with the active participation of the trade union, which is making a big contribution to the training of medical personnel, improving their labour conditions and cultural requirements.

The Medical Workers' Trade Union seeks to make extensive use of all opportunities for exchanges with similar trade unions and medical workers abroad.

Locos Linking Pacific and Caribbean Coasts

The first of seven locomotive units were recently shipped to Colombia for use in the construction of that country's Atlantic Railroad — an ambitious plan which will link Colombia's Pacific and Caribbean coasts



The locomotive in the photo was shipped to New York on top of a railway freight car, since it was made for operation over 42-inch gauge tracks and could not be operated on standard gauge tracks used in the U.S. Standard gauge tracks are 56.5 inches in width. It is shown as it was loaded aboard a Granacolombiana freighter in New York recently.

together. Made by General Electric's Locomotive and Car Equipment Dept. in the U.S.A., the locomotives are being sent to Buenaventura, the Pacific coast terminus of the Atlantic Railway. Colombian National Railways officials say they expect the line to be finished sometime in 1960. Work is currently going on on sections to the North of Bogota in the Magdalena Valley.



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LIVE ANTI-POLIOMYELITIS VACCINE

By Professor A. Smorodintsev

Corresponding Member, U.S.S.R. Academy of Sciences

THE pathogene which causes poliomyelitis is a tiny virus that enters the human body through the mouth and multiplies in the intestinal tract. In the most susceptible persons, it enters from the intestines into the blood and thence into the central nervous system, destroying the nerve cells. This leads to paralysis of the muscles of the arms, legs and trunk. The wide-spread incidence of this disease in the world has been a source of great anxiety in the last few years.

In view of the growing danger, scientists turned their efforts to the discovery of preventive methods. It has been known for a long time that persons having once suffered from poliomyelitis remain immune to further infection. Scientists have, therefore, striven to find a method of creating artificial immunity through vaccinations. They were particular that the virus of poliomyelitis entering in the composition of vaccine must entirely be harmless to children and not cause any symptoms of the disease or any other less dangerous reactions.

The first effective anti-infant paralysis vaccine was developed by the American scientist, Jonas Salk, in 1954. He reproduced highly pathogenic viruses of poliomyelitis in cultures prepared from the living cells of the nephric tissue of apes, after which he killed the reproduced viruses with formalin. The vaccine, thus rendered harmless, was injected three times subcutaneously or intramuscularly. This vaccine reduced fatal cases among millions of children inoculated by about 75 per cent.

TOO EXPENSIVE

Salk's vaccine has some substantial defects too. The proportion of children whom it protects from poliomyelitis is not over 75 per cent of those who are inoculated. The rest remain susceptible and may fall victims to the infection. The immunity acquired after three injections of the dead vaccine does not last long, so that the injections have to be repeated every two or three years. The preparation also is very complicated and expensive. It is prepared on the nephric tissue of apes brought by plane from India and China. At least 1,500 apes are needed to prepare a million doses, whereas the number of children and juveniles

requiring vaccination in the U. S. S. R. is about 80 million. These serious drawbacks naturally increased the scientists' interest in the study of live vaccine, a preparation affording better prospects. It is composed of specially obtained harmless veruses, deprived of the capacity of developing in human nerve cells and injuring them. When live vaccine, containing millions of active virus particles, is injected, for example, into the brain of apes (who are much more susceptible to the pathogene of poliomyelitis than human beings) the animals, as a rule, are not observed to develop any pathological reactions.

A great advantage of live vaccine is that its preparation is simple and inexpensive: 100,000 doses can be prepared from the kidney of one ape.

Live anti-poliomyelitis vaccine was developed and studied by the joint efforts of American and Soviet scientists. After many years of work, the American virologists, I. Koprovsky and A. Sebin, obtained weak poliomyelitis viruses which, as has been said, became harmless to the anthropoid and lower apes not only after oral administration, but after direct injection into the brain.

But extensive observations were still necessary before the harmless nature of the live vaccine and its effectiveness could be finally established. Its effect on a mass vaccination had to be studied. This was done in the Soviet Union. "Why is it necessary to search for live vaccine," said the opponents of the new method, "when we already have an entirely harmless and widely tested dead vaccine?"

The great work accomplished in the course of the last four years by the Leningrad Institute of Experimental Medicine of the U. S. S. R. Academy of Medical Sciences has given an answer to this and many other questions. In 1956 we prepared a consignment of live vaccine from the weakened viruses of Dr. Sebin and began observing its effect from the beginning of 1957.

SOVIET TESTS

In 1958 1,250 infants were vaccinated with this new vaccine. The same number of children, who

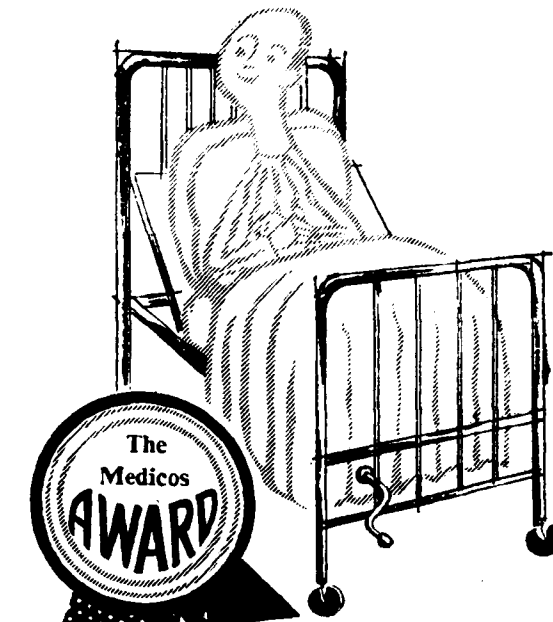
were in constant close contact with those who had been inoculated, did not get any vaccine. Clinical observations gave additional proof that the vaccination was completely harmless, both for the children who were inoculated and those who were in contact with them. A new objection was raised: admitting that the live vaccine had proved harmless for 2,500 children, the figure was too small for the solution of so important a problem. At least 100,000 children ought to be inoculated before it could be pronounced harmless. In the first quarter of last year about 20,000 children and in the second quarter one and a half million more children up to 14 years of age in Byelorussia, Latvia and Moldavia were vaccinated. The Institute for the study of poliomyelitis of the U. S. S. R. Academy of Medical Sciences has been doing similar work since 1959. By the end of last year there were already 12 million children in the U. S. S. R. inoculated with the live vaccine and there was among them not a single case of poliomyelitis caused by vaccination. In the epidemic season (June-November) the number of poliomyelitis cases among the children who had been inoculated with live vaccine was 10 times less than among those who were not vaccinated. Two or three injections to susceptible children proved entirely harmless and were more effective in preventing the disease than Salk's dead vaccine.

TOWARDS ERADICATION

Pathogenic stray viruses are not found in inhabitants inoculated, since the necessary conditions for reproduction of the pathogene are absent in the intestinal tract of vaccinated children. Poliomyelitis retreats rapidly under the onslaught of live vaccine and the danger of new epidemics is steadily heading towards complete eradication.

Live vaccine is now produced by the Moscow Institute for the study of poliomyelitis in the form of a liquid which can be taken in with a spoonful of sweet syrup or water, or in the form of candy. When the vaccine is administered orally as a liquid or a candy three times (at monthly intervals), immunization becomes an easy and even pleasant process.

The whole juvenile population of the Soviet Union up to the age of twenty is to be vaccinated against poliomyelitis within a few months. This energetic attack on poliomyelitis with the aid of highly effective live vaccine is conducted for the first time and shows to the whole world the advantages of the Soviet medical system.



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PREVENTION AND CURE

By K. K. Subramanian
P.A. to C.M.O., Central Railway

"PREVENTION is better than cure" is an age old adage, more observed in the breach than otherwise. Even in this modern and enlightened age, there are many who seem to think that sickness and injuries arising out of accidents are to be borne patiently and suffered in silence. With a scientific approach, it should be possible to spare ourselves and members of our families a considerable amount of suffering.

According to modern trends of thought, preventive and curative health should dovetail into each other if maximum results are to be obtained. Whatever measures a Government might take for improving the health conditions in a country, little can be achieved without the fullest co-operation of the individual whom it serves. The eradication of undesirable habits and the development of good habits can follow only through this co-operation. Scientific knowledge should be utilised in the prevention of disease, and only when efforts in this direction break down, should therapy come into play. By following certain simple rules, a few of which are set out below, it is possible to lead a healthier life:—

- (a) Environmental hygiene—Cleanliness is next to Godliness and it should not be difficult to maintain a high standard of cleanliness in one's residence. One should never collect inside the house anything which is not necessary. Junk can be deposits of dust and disease, and should never be allowed to collect in the house. The house should be kept free from fly nuisance. More diseases are spread by flies than one would dream of.
- (b) The water used for domestic purposes should be bacteriologically pure. The safest method of ensuring its purity is to boil water before drinking from whatever source it is obtained.
- (c) Next to water, air has the most important bearing on health. So, ensure a free supply of pure fresh air. Keep windows and ventilators fully open, and never cover your face when you sleep.



Sri K. K. Subramanian

- (d) The average Indian diet is inadequate in respect of quality and quantity in regard to essential vitamins. Vitamin deficiencies of a pronounced character manifest themselves in various forms of diseases. According to one's own resources, increased consumption of milk and vegetables should help in providing a nutritious diet.
- (e) As Railway employees, the Medical Department offers free facilities for vaccination and inoculation. As a routine, all should get immunised against:
 - (1) *Small-pox*—With its abnormally high incidence of suffering, incapacitation and death is perhaps the most easily controllable—amongst infectious diseases. If vaccinations are performed at regular intervals with a potent vaccine lymph, the level of immunity can be raised so high as to eliminate Small-pox as a community disease.
 - (2) *Cholera*—Preventive inoculation confers effective immunisation, and during times of epidemics, action should be taken to maintain a high standard of hygiene.

- (3) *Plague*—Plague is comparatively of rare occurrence, but during times of epidemics, it is necessary to immunise yourself by inoculation.
- (4) *Veneral Diseases*—In all cases of promiscuity in sex relationship, there is danger of exposure to infection. Advice on—personal prophylaxis should be sought within a very few hours of exposure.
- (5) *Tuberculosis*—Considerable success has been obtained in prevention of Tuberculosis by BCG. vaccination, and everybody can take advantage of it.
- (6) *Malaria*—Malaria is considered to be by far the most important disease in India from the point of view of sickness and mortality. By taking suppressive treatment against Malaria, individuals can obtain a fair degree of protection against the disease.

The most important factor is the maintenance of a high standard of personal cleanliness.

Accidents—Some people still believe that accidents are accidental or inevitable, regrettable of course, often tragic but still accidents—an accident just happens—a price we have to pay for production. We need to keep reminding ourselves that accidents can be prevented, indeed must be prevented. The task of accident prevention consists in tackling the problem in its totality, i. e. from as many angles as are revealed by different factors which invariably contribute to a single accident. A great authority on prevention of accidents has mentioned that there are three 'E's of safety—Engineering, Education and Enforcement. The removal of a physical hazard is obviously easier than coping with the human factor, and must therefore be attended to first. It is for the Engineers to ensure that the conditions have been rendered safe for working. Mechanical causes of accidents are well recognised, and much has been done, and more could be done by accident prevention measures to reduce their numbers. The Engineers in charge should be aware of the dangers of hazardous operations, arrangement of work, improper guarding, defective equipment and unsafe dress. In addition, various aspects of the working—environments which

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are contributory causes affecting the incidence of accidents should be recognised. These include hours, speed and type of work, lighting, heating, ventilation and other conditions.

After the working conditions have been rendered safe the next step is the EDUCATION of the workers. The workers should be educated in simple safety rules covering points like :

- (1) Do not feel about while at work. Keep your wits about you, and your mind on your job.

(2) Wear the right clothes for the job. Around machinery, wear no loose or rigid garments, long sleeves, tight jewellery or groves. Wear gloves when you handle rough or sharp material. Protect your feet where necessary.

(3) Use the right tool for your Job. Keep tools free from oil, dirt, etc.

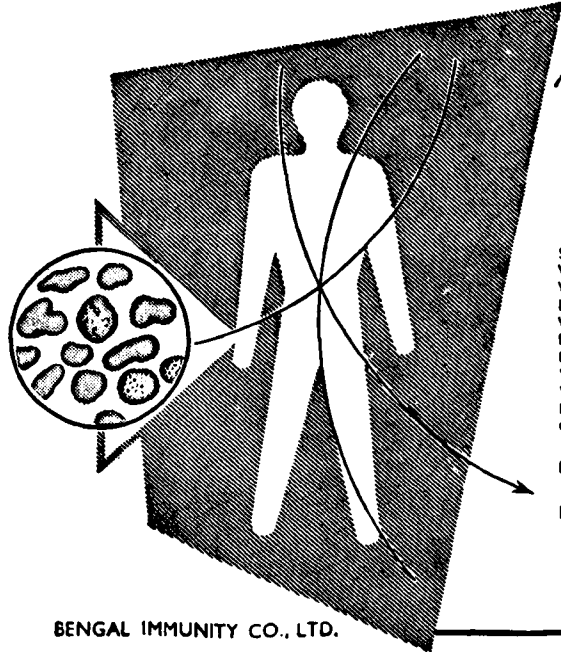
In spite of providing safe working conditions, and education in safe methods of work, accidents may continue to occur through carelessness, laziness and insubordination. These should be removed by ENFORCEMENT.

Lastly, a final word in prevention of accidents in our own homes. A number of home accidents are traceable to lack of planning such as an odd step, insufficient lighting, doorways too close together, slippery floors, etc. The following simple rules will help avoid a number of pitfalls :—

- (1) Every house has a small medicine cupboard. Keep all poisonous substances and external applications in a separate compartment, and put away Aspirin, sleeping tablets and other drugs where children cannot sample them.

(2) Boiling liquids should be kept out of the way of children.

(Continued on page H.S.26)



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Hospitals on the South Eastern Railway

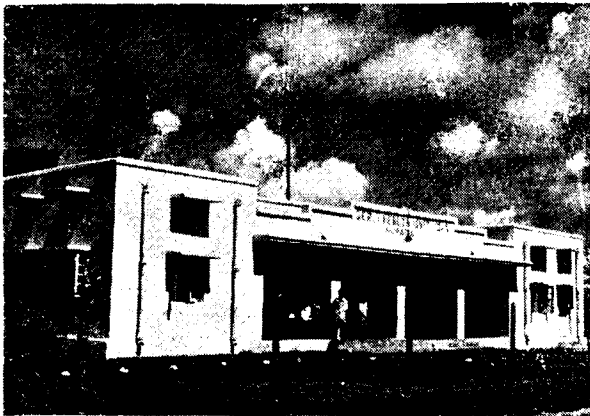
By Dr. A. Ramdas
Chief Medical Officer, S. E. Rly. Calcutta-23

INTRODUCTION

THE present South Eastern Railway has jurisdiction over the territory formerly under the ex: Bengal Nagpur Railway ownership. The latter, being a Company-managed Railway, was content to provide a few well equipped hospitals and dispensaries.

During the First and Second Plan periods, there was a spate of developmental activity on the S. E. Railway. In a short span of years there was a tremendous expansion of the different departments and consequent increase in number of staff. The

was well provided for even during the Company management days. It has always had a fine reputation locally and catered to the extent possible to the medical needs of the local non-railway population



New Dispensary opened at Naupada, on the Howrah—Waltair section.

also. It has evolved over the years into a centre from which different aspects of the medical services reach the population it serves.

The maternity wing is greatly popular with families of staff. There are seven area dispensaries round about Khargpur and these look to the hospital for taking in complicated cases. The local School



A view of the Railway Hospital, recently opened at Tatanagar.

need for medical amenities was acutely felt. Expansion of Hospital facilities gathered momentum. Today while the existing hospitals are being expanded, new hospitals are under construction at different centres. Many more are being planned for construction in the Third Plan.

KHARGPUR HOSPITAL

Our biggest hospital with 170 beds is at Khargpur. Situated in pleasant surroundings, it serves the population of this biggest Railway colony on the Indian Railways. The hospital is well equipped with all facilities required in a modern hospital. This hospital



An exterior view of the Railway Hospital at Garden Reach. This majestic building was once the residence of the Railway's General Manager.

Health Scheme is centred round the hospital. Annual mass vaccination and inoculation programmes are carried out by the Public Health staff under the guidance of the hospital administration. These have



An operation being performed in the Railway Hospital, Khargpur.

been so successful during the last few years that the incidence of infectious diseases in the Railway colony is almost negligible while the surrounding civil territories have been subjected to periodic outbreak of epidemics.

ADRA

Adra, which is the headquarters of the busy Colliery district of our Railway, has a modern 100-bed hospital. The hospital is more modern in design than the Khargpur Hospital, as it has been constructed later. It is also located in pleasant surroundings and has been popular with the staff.



Dressing of wounds in the new Tatanagar Hospital.

GARDEN REACH

There is a 55-bed hospital at Garden Reach. This hospital is meeting the medical needs of the large headquarters population residing at Garden Reach and in the city of Calcutta. The building is located in a picturesque place on the left bank of the Hooghly. The patients get a panoramic view of the river with variegated traffic, of ocean going ships, tugs, and sail boats. The hospital building itself is an ancient mansion which was once the residence of a Nawab and then that of the General Manager. The massive Grecian columns of the building provide an impressive facade. This hospital is to be shortly expanded to hold 100 beds and modern medical equipment.



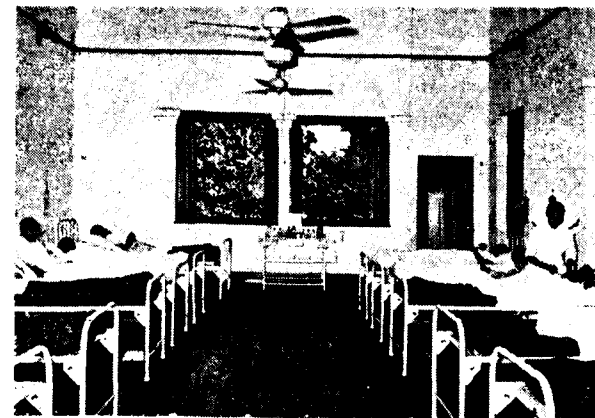
Interior view of the new Maternity Block in the Railway Hospital at Khargpur.

BILASPUR & WALT AIR

Bilaspur and Waltair, which are district headquarters, have 30 and 20 bed hospitals respectively. These are located in improvised premises. As Bilaspur is the headquarters of a Region now, a new 50-bed modern hospital is under construction at this station. A new 50-bed hospital has been proposed for construction at Waltair. This station has grown in importance with the location of an Oil refinery and ship building yard. With the development of the Dandakaranya Scheme, the importance of Visakhapatnam port serving Waltair will increase further. This has necessitated planning for a 50-bed hospital.

NAINPUR

Nainpur, which is the headquarters of the charming hill district of Satpuras in Madhya Pradesh, has a 20-bed hospital. This serves a 649 mile district of narrow gauge railway. The hospital is situated in a



A ward in the Railway Hospital at Garden Reach.

beautiful shady railway colony whose concreted roads always look clean and new. This hospital serves a large population which is not so well provided with alternative medical facilities.

TATANAGAR

A beautiful, modern 30-bed hospital was recently opened at Tatanagar station which serves the gigantic steel plant at Jamshedpur. The hospital is located on a commanding site and has spacious, well-lit and ventilated premises. Tatanagar is a sub-district of the medical district of Khargpur.

CHAKRADHARPUR

Chakradharpur, which originally was a station of

moderate importance on the Calcutta-Nagpur line, is growing into a big centre which will be the hub of the iron ore and coal traffic connected with the steel industry. There is at present a 10-bed hospital which is under the Adra medical district. A 20-bed extension is almost completed. Ultimately a still bigger hospital will have to be provided here.

KHURDA ROAD

A new and modern 20-bed hospital is nearing completion at Khurda Road. This hospital is modelled on the lines of the new hospital at Tatanagar. When completed, it will serve the needs of a region of the Railway which till some years ago was not so well served by Railway hospitals.

CONCLUSION

Our Railway Administration is aware of the growing needs of our employees as regards hospital services. A comprehensive scheme for considerably expanding the existing hospitals and construction of many new ones is being formulated. Schemes for improving the standard of treatment given in our hospitals are being formulated and diligently implemented. Our hospitals of the future will not only be centres for healing our sick and the injured but also the foci from which activities for promotion of health of our population will emanate.

EMBELIA (BABRANG)

Embelia (Babrang), berries of a climber commonly found in India, Ceylon and Singapore, has proved a positive cure for almost all the dental, oral and throat troubles except pyalism and cancer of the lip. Pyorrhoea will not be regarded incurable now. For the first time in the history of medicine, Embelia has been found effective in curing these ailments. It was generally used as an anthelmintic (vermifuge) for the past three thousand years. Noted dental and general hospitals in different parts of the globe have been provided with the drug for further investigation. Such institutions include Bellove Hospital, New York, Saskatchewan Hospital, Battleford and General Hospital, Madalay.

Dr. Sushila Nayar, former Health Minister, Delhi State, is conducting further research on the drug. This is the second distinguished discovery of the Ayurved Research Council of Delhi. The first one was Punarnava which proved panacea for eye-troubles and created sensation throughout the world by eliminating spectacles. The German, U. K. and U. S. scientists busied themselves in making use of its curative properties. During his sojourn in India, President Eisenhower carried Punarnava to White House. Research scholars from abroad are calling upon the President of the Council, Kaviraj K. L. Khetal, to secure details of how Eastern preparations are going ahead of even the Western ones.

NORTHERN RAILWAY SECTION

FAMILY PLANNING

1. *AIMS and objects*—The practice of Family Planning is necessary because—

- (1) It safeguards the mother's health, removes constant dread of unwanted pregnancies, saves her from the risk of frequent and uncontrolled conceptions and thus enables every couple to discharge their duty towards each other.
- (2) It helps parents to plan their families and have children by choice and not by chance, ensures health and happiness of children, limits the size of the family within their resources and thus enables parents to carry out their duty towards their children.
- (3) It stabilises the population within the resources of the country, gives an opportunity to every couple to build a happy, vigorous and prosperous nation.

The purpose of Family Planning is to promote, as far as possible, the harmonious growth of the family and thus to contribute towards such conditions as are necessary for the welfare of the community from the economic, social and cultural points of view.

Family Planning includes limitation or spacing of children and also such other measures as may be necessary to promote the welfare of the family, such as advice on preparing the young for responsibilities of marriage and parenthood, infertility, eugenics, sex education, marriage guidance and marriage counselling. Most family planning centres, however, mainly give advice on limitation and spacing of children, as it is an urgent problem on account of our

resources not being able to keep pace with the growth of population.

In many parts of the world—and India is amongst them—the relationship of population to the resources, that may be expected to be produced, is such that a purposeful limitation of numbers seems to be the one way of securing and maintaining community life under civilized conditions. He has been able to control deaths. He should naturally control also births. In the past whenever the population exceeded the means of subsistence, famines, epidemics, droughts, floods and wars came as counter-balancing factors. Today human intelligence demands the solution of the problem on a more rational basis. The only solution, therefore, left to us is Family Limitation.

2. *Risks of repeated pregnancies*—There is a common belief that child-bearing is relatively free from danger amongst mothers of five or six children. The fact, however, is that the danger increases steadily after the 4th pregnancy and is almost double after the 6th and with the 10th the danger is almost five times that of the first. Child-bearing is a normal physiological function for all healthy women; pregnancy and confinement should obviously be undertaken under proper conditions, well spaced out and limited in number. Dangers associated with child-bearing increase with wide prevalence of mal-nutrition and under-nutrition and the high incidence of disease. Prospective mothers should be well-equipped for the task of pregnancy and child-birth. Lack of antenatal care and skilled attendance at the time of confinement as well as a whole host of debilitating causes associated with poverty, insanitation and inadequacy of medical care throughout the lives of these women have their cumulative effect in making their

(Continued from page H.S. 22)

- | | |
|---|--|
| (3) Don't leave cupboards, doors and drawers open. | (6) Never use inflammable liquids for dry-cleaning, etc |
| (4) Never meddle with gas, electrical or mechanical appliances. | (7) Never leave ends of lighted matched or lighted cigarettes about. |
| (5) Keep the floors clean and dry. Clean floors prevent many slips and falls. | (8) Hammer down or pull out all upturned nails. |

health deteriorate more and more as they go through a progressive course of child-bearing. Spacing of successive pregnancies provides a strong measure of safety towards preserving the health of mother. There is, of course, an added advantage that a smaller number of children in family will make the available resources go a longer way towards the provision of necessary comforts to them and towards their proper upbringing; family limitation helps to provide better care for both the mother and the child.

3. *Diseases in which it is unfair for the mother to become pregnant*.—

- (1) General debility.
- (2) Serious acute illness.
- (3) Cardiac lesions like heart failure and serious complications like auricular fibrillation.
- (4) Acute pulmonary disease.
- (5) Pulmonary Tuberculosis.
- (6) Kidney degeneration.
- (7) Severe anaemias.
- (8) Repeated Toxaemias of pregnancy.
- (9) Repeated puerperal insanity.

4. *Diseases amongst parents in which it is unfair to the child to be brought to this world*.—In fairness to the child, every married couple must make sure before the conception takes place that they have no serious diseases which they might pass on to the child. Apart from well-known diseases like venereal diseases, parents are likely to pass on to their children diseases like haemophilia, Huntington's chorea, epilepsy, Friedreich's ataxia, hereditary cerebellar ataxia, paralysis agitans, amaurotic familial idiocy, myopathies, albinism, mental diseases (dementia praecox, depressive maniac psychosis), congenital deafness, mutism and blindness.

5. *Ideal family*.—It is difficult to lay down rigidly the number of children each family should have. So far as India is concerned as already stated that parents should have not more than three children. A single child often creates the difficult problem of a solitary child. The disparity between the ages of children should also not be such that they are robbed

of companionship. It may be added that two children also are not always free from psychological unhappiness to which children in pairs are prone (for example a brother getting jealous of his sister).

It is well to remember that the chances of having children decrease with advancing age. It is not a wise policy to postpone the first pregnancy for too long. It is desirable to have the first child when the parents are still full of life and vigour, so that by the time the parents reach the middle age, the children are grown up and able to look after themselves. In the interest of both mother and child there should be a minimum interval of two or three years between children.

6. *Are contraceptives harmful*.—There is no evidence that the use of contraceptives is harmful, unnatural or promoter of vice, self-indulgence. On the other hand it safeguards the mother's health, it removes the dread of unwanted pregnancies, saves her from the risk of frequent and uncontrolled conceptions and thus enables every couple to discharge their duties towards each other. It helps parents to plan their families and have children by choice and not by chance, ensures health and happiness of the children, limits the size of the family within their resources and thus enables the parents to carry out their duties towards their children. It stabilizes the population within the resources of the country and gives an opportunity to every couple to build a happy, vigorous and prosperous nation. Few countries in the world today are faced with such a serious population crisis as India and to bring happiness and prosperity to every family and to the country, resources must be developed and population controlled.

7. *Education*.—Every married couple has to be persuaded firstly not to have any more children if they already have three or more children, if they have one or two children, not to have the third till the last child is 3 years old and secondly to avail themselves of opportunity to take and popularise birth control advice and expand the campaign. All avenues have to be explored whereby social forces favourable to family planning are able to operate effectively and the slogan "FOR HEALTH AND HAPPINESS FAMILY PLANNING" is carried to every home. The problem is difficult. The programme is being conducted with a sense of urgency, determination and confidence.

8. *Requirements of a Family Planning Centre*.—It is desirable to have three rooms with lavatory

facilities accessible to these rooms. One room as a waiting room, second room can be used for interviews and taking the preliminary history and a third room for examination, with screen for dressing. If available accommodation permits, the examination room can be divided into two sections, one section for medical interview and general physical examination, equipped with a table, two chairs, blood pressure instrument, stethoscope and other medical apparatus and the other section with wash basin and running water, an examination table, instrument cabinet, table, headlights, sterilizer, gloves, enamelware, speculum, sheets, towels, gowns, contraceptive material, teaching charts and models, printed instructions, etc.

9. Instructions for the Family Planners (Parents).—

- (1) Visit your nearest Family Planning Centre, Hospital, Maternity and Child Welfare Centre or Health Unit, consult the doctor for advice and avail of his FREE services.
- (2) You will be examined by a qualified doctor whose advice is of great importance before any method of family limitation is adopted.
- (3) The doctor will suggest the method which is simple, effective, convenient and readily available and suitable to your individual needs.
- (4) After the first visit, check-up visits are essential, to confirm whether the method advised is suitable and is being correctly followed. You can also take this opportunity to discuss your difficulties freely.
- (5) The first check-up visit should usually be one week after the initial visit and subsequent visits should be made as advised by the doctor.

10. Procedure of examination at the Family Planning Centre.—

- (1) Every care should be taken that social and cultural values are not affected.
- (2) Contraceptive advice is given to married couples only.
- (3) Record last date of menstruation and other information on social and marital history in the card provided for this purpose.

In case the woman has missed her menses she is asked to return to the centre after her menses have been re-established or if she is pregnant after the birth of her baby. Pregnant women can be given assistance for admission to a maternity home, if required. The patient is then explained elementary facts of structure and function of the female and male sex organs, physiology of human reproduction and the methods of conception control generally advised at the centre.

- (4) Discussion and questions should be encouraged.

- (5) The woman then may be asked to empty her bladder (and if facilities exist routine examination of her urine also can be done.) She is then examined by the physician who takes down the past and present medical history, the pattern of marital sex life (if possible) and examines the patient and prescribes the contraceptive which is required and acceptable to her and gives detailed individual instructions. Generally it is necessary to call the patient for a check-up visit after a few days. She is asked to come with occlusive cap in position (if such a contraceptive is advised to her) for check-up visit. She is warned not to use the method until after the check-up visit.

- (6) Anxieties generally associated with use of contraceptives should be removed, *e. g.*, she should be assured that clean fingers cannot do any harm if inserted in vaginal passage, the vagina ends in blind pocket and contraceptives cannot enter abdominal cavity, contraceptives are harmless and their use can be learnt without any difficulty.

- (7) The contraceptive advice given may be explained also to the husband especially when it is to be used by him.

- (8) Any unilateral decision taken by any partner especially in matters of sex may meet with failure. Opportunity should always be taken to create interest in family planning in the husband.

- (9) Cases requiring sterilization should be referred to hospitals where necessary facilities exist. Every assistance should be given that the operation is performed and record should be kept of cases operated.

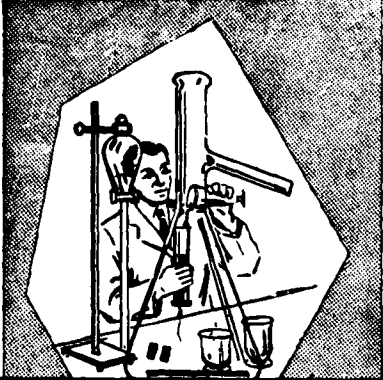
- (10) If any abnormalities or pathological conditions are detected at the initial examination or check-up visits, the patient should be referred to appropriate person for treatment.

- (11) Advice on sterility and marital problems may be also given whenever required or patient referred to appropriate specialist. The centre should be developed as teaching centre for doctors and research centre for evaluation of educational and contraceptive techniques.

- (12) If the husband or wife have conscientious objection to the use of mechanical and

chemical methods, their point of view should be respected and appreciated. They may be given advice on safe period and coitus interruptus if considered suitable, explaining the limitation of these methods. It may also be explained that abstinence in married life is not injurious to health. But in most cases abstinence is not practical proposition. Married couples who mutually agree to abstain from sexual union for a certain period need have no fear of ill effects.

11. Genetics in relation to clinical medicine.— Marriages of near relations is biologically hazardous especially where there is record of genetic abnormality in the family. Although most causes of deaths and diseases are not traceable to genetic origin, appreciable number of some diseases are due to genetic defects. 10-25 Per cent of all deafness is genetic in origin whilst genetic cause of partial and total blindness accounts for about 10 per cent of the whole.



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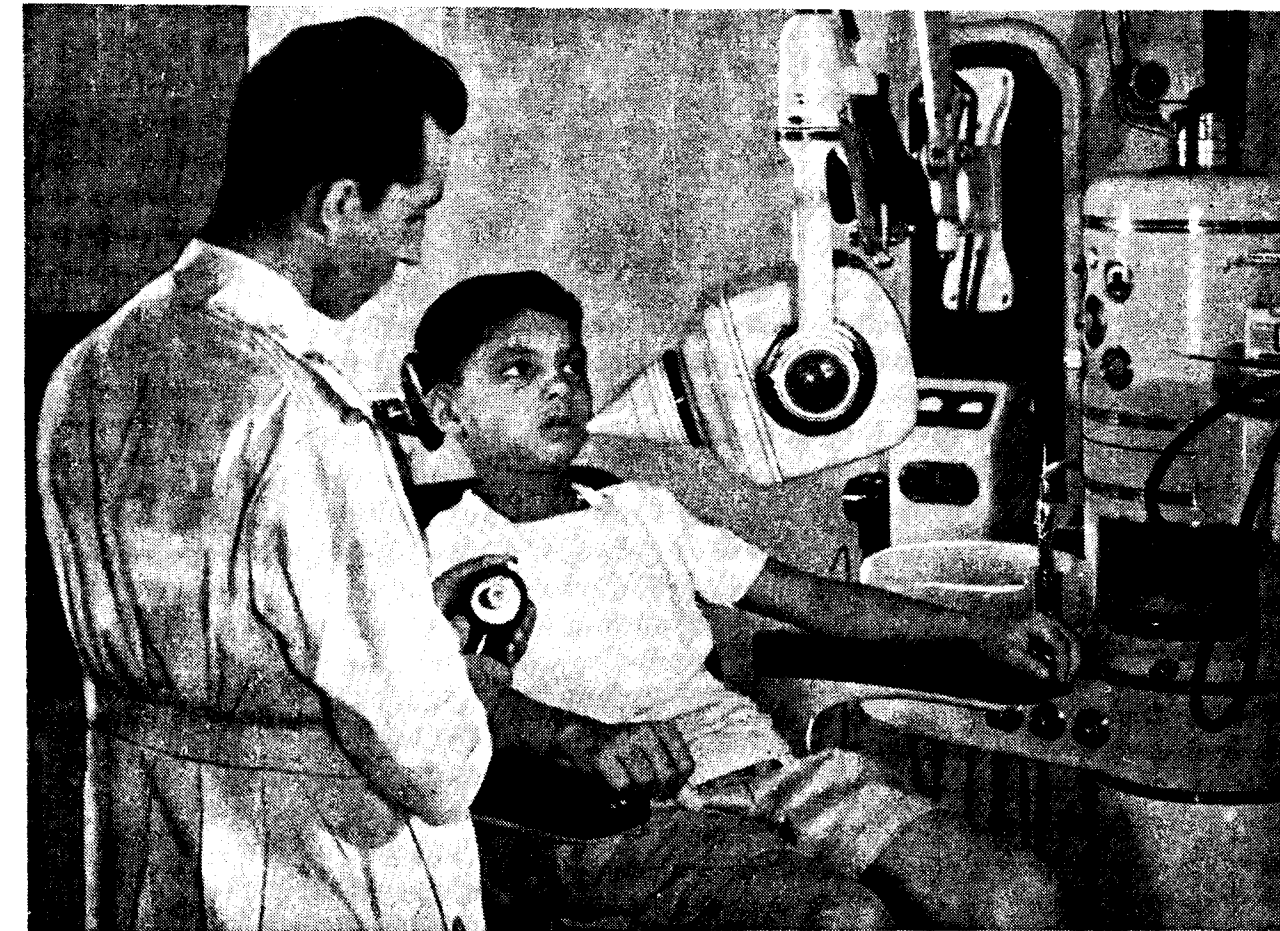
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The following further illustrative examples are : —

		Angioneurotic oedema	"Heredity is an important factor."
Acholuric jaundice	"The disease may be hereditary."	Acute bronchitis	"It is probable that some degree of hereditary pre-disposition occurs since 'weakness of the chest' is common in some families."
Hepatomegalia glycogenia	"The relatively high incidence of cousin marriages among the parents of affected patients suggests that the condition may possibly be inherited as a Mendelian recessive character."	Asthma	"Certainly runs in families. The heredity is not always direct, the nervous instability sometimes being evidenced in other generations by migraine, epilepsy or hysteria. It is believed that an unduly irritable bronchial centre is the factor transmitted by heredity."
Cirrhosis of the liver	"Is in very rare instances familial, presumably as a result of an inborn defect of the liver cells."		
Pernicious anaemia	"There is a hereditary proclivity."	Pulmonary tuberculosis	"Children may inherit the tuberculous diathesis."
Sickle-celled anaemia	"It is hereditary and familial, be having as a Mendelian dominant."	Rheumatoid arthritis	"It does not appear that the disease is hereditary, but it seems likely that there is an inherited diathesis."
Haemophilia	"In Mendelian terminology it is a sex-linked recessive."	Osteogenesis imperfecta	"The condition is hereditary in 27 per cent of cases."
Hereditary Purpura Haemorrhagica.	"It is hereditary disease. It is transmitted directly from generation to generation and affects female twice as often as males (hence the term 'female haemophilia')."	Osteopasthyrosis	"A history of inheritance from generation to generation is common."
Hereditary Haemorrhagica Telangiectasia.	"Behaving as a Mendelian dominant."	Achondroplasia	"The disease may be transmitted through the male line. Its occurring in three generations has been recorded."
Gaucher's disease (Splenic and hepatic enlargement).	"It is possible that the condition is due to an inborn error of metabolism."	Eczema	"There is a possibility of an inherited susceptibility or diathesis."
Fatty degeneration of the heart.	"Heredity is a factor."	Hydrocephalus	"Hereditary influences are of importance in the causation of congenital hydrocephalus."
Angina pectoris	"Heredity is a factor."	Amaurotic idiocy	"Nothing is known of the aetiology of the disease apart from its familial and racial incidence."
Congenital heart disease	"Heredity is probably a factor."		



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Friedreich's ataxy	"Indirect heredity is the most common for the reason that the subjects of this disease are usually affected in childhood and incapacitated by the time adult life is reached so that they do not procreate. Direct heredity is, however, by no means as uncommon as has been supposed and in one family the disease has been transmitted from father to son for seven generations."	Pseudohypertrophic paralysis.	"In certain incidences a family history is obtained, always on the mother's side. Commonly, several children are attacked in each generation.
		Senile dementia	"Heredity is held responsible for the wide differences in mental health among elderly people."
		Affective disorders	"Heredity is the most constant single cause. In the major maniacal depressive cases the genetic factor is weakly dominant."
Familial spastic paralysis.	"The disease is sometimes hereditary but is more commonly familial."	Schizophrenia	"Studies of the incidence in twins and in the members of a family demonstrate a hereditary factor, in a majority of cases. If one of a monozygotic pair of twins is schizophrenic the other is also in 70 per cent of cases. The frequency of the illness among various relatives of patients indicates that it is not transmitted as a simple dominant nor indeed as a simple recessive, probably more than one recessive gene is responsible."
Huntington's chorea	"Further than heredity no casual factors are known."		
Peronea muscular atrophy.	"Heredity plays an important part in its incidence."		
Myotonia congenita	"A very rare malady which is hereditary and familial."		
Dystrophia myotonica	"The heredity is homologous, that is, it tends to appear in the same child rank in a number of apparently unconnected families at a common distance from one and the same ancestor and often seems to be entirely confined to one child rank."		
		Obsessional disorders	"The hereditary factor is strong. A third of the parents of obsessional patients and a fifth of their brothers and sisters have themselves shown pronounced obsessional-traits."
Familial periodic paralysis.	"Heredity is very marked and the malady has been traced through five generations. Transmission may occur either through the male or through the female and not infrequently a generation is skipped. Several members of the same family are usually affected.		

12. *Techniques of conception control.*—The ideal contraceptive should be simple, harmless, acceptable, reliable and inexpensive. The perfect and ideal contraceptive has yet to be discovered. Sufficient information however is available to achieve reasonable control of conception. Sterilization of the male or female is 100 per cent reliable. Condom is simple, easily available and reliable method. The diaphragm

and jelly are harmless and reliable in over 90 per cent of cases. There are other methods such as chemical contraceptives like jelly, cream and foam tablet which although not as reliable as condom or diaphragm and jelly, have the advantage of simplicity. Any method suitable to an individual need may be advised.

13. *The methods of control of conception generally followed.*—Mechanical and Chemical, Safe period, Husband being careful or coitus—interruptus, douche, sterilization and abstinence. Mechanical and chemical contraceptive may be used by the husband (use of condom or sheath preferably with a chemical contraceptive) or the wife (use of an occlusive cap combined with a chemical contraceptive or jelly alone with applicator, or foam tablet or sponge or tampons with chemical contraceptive).

(1) *Condom*.—The Condom is the most simple, easily available and reliable method of birth control. It is one of the oldest and widely used method and was first described as early as 1564 by Fallopius. Where it is acceptable to both husband and wife, it

should be recommended. During the first weeks of marriage when local pelvic conditions prevent the use of diaphragm and where man has to exercise the contraceptive control condom appears to be the contraceptive of choice. In a few cases where husband is careless or use of condom puts a conscious mental strain on either partner or interferes with sexual excitement or erection of the penis it should not be recommended. The condoms are made of two types of material, viz., sheet or latex rubber and 'Skin' usually of peritoneal covering of animals intestines. The rubber condoms are also thin for use once only and thick and washable for use for several times. Thickness of the latter has tendency to dull the sensation. They are made with teat shaped and/or with plain end.

These are of two types according to size, *i. e.*, those which cover only the glans and those with full length. Those which cover the glans only are not

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suitable as they tend to roll off during coitus. The skin condoms generally provide less dulling of sensation than rubber but they are more expensive, inelastic, difficult to test, requires damping before use and on the whole difficult to use. For all practical purposes thin rubber condoms are satisfactory and generally acceptable.

The most important factor in the use of condom is to get one of a good quality, to test it before use and to use it with care. They should be of reliable brand and from a good store. The condom can be tested by inflation. The opening can be held between two fingers and the body allowed to hang down. Air can be blown by the mouth and the condom inflated to a size about 6×12 inches. It can be tested before a diffused light for pinholes which appear as white specks. The portion suspected of pinholes can be tested by holding it close to sensitive area of the face.

Testing can also be done by filling the condom with tobacco smoke and examining for leakage of smoke, or by filling it with water. The latter course is not satisfactory as it renders the condom sticky and difficult to use.

The condom before use is rolled down. About half an inch at the end may be left loose with air expelled and then it should be unrolled over the erect penis. This is necessary to allow space for holding semen and to prevent breakage. The condom should be used right from the beginning of intercourse (and not just before ejaculation) as sperms are likely to be present in pre-ejaculatory fluid. No artificial lubricant is generally required as there is sufficient pre-coital fluid. If however there is not sufficient moisture a good contraceptive jelly cream or water-soluble surgical lubricant can be used. The base of the condom should be held carefully before withdrawal.

In case of a condom tearing by accident the vagina should be swabbed with lather of white soap and water. As a further safeguard against such tears a chemical spermicide (jelly, cream or a foam tablet) may be placed in vagina before intercourse.

After removal, the condom can be examined for small holes but this is possibly observing exceptional care and may not be necessary if it has been examined carefully before use.

- (2) *Occlusive cap with a chemical spermicide.*—
All the occlusive caps are made of rubber

except the Dumas cap (which is also available in plastic) and some cervical caps (which are available in rubber, plastics, celluloid or metal).

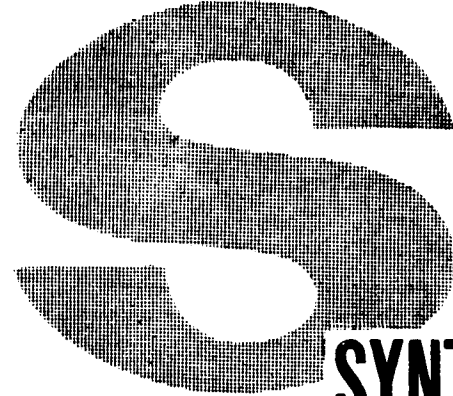
These caps can be divided in two main groups each based on different principle. Cap of one group is placed over the cervix and adheres by suction around its projecting cone. Cap of the other group (diaphragm) is placed lengthwise and divides the vagina into two parts, the upper part contains the cervix and the lower part is free for entrance of the penis. The well fitting cap by itself does not provide protection. Between the junction of vaginal wall and the rim of the cap there are small spaces left through which sperms can readily gain access to cervix. It is, therefore, necessary to use a chemical contraceptive along with the cap.

- (3) *Vaginal Diaphragms.*—They are known under various names like Mensinga, Ramses, Lambert, Haire, Dutch, Caps (diaphragm) pessaries. The protection is provided by a mechanical barrier and chemical spermicide. The original diaphragm described by Dr. William Mensinga has a flexible flat watch-spring rim. The diaphragms now generally used have coiled-spring rim. The thickness of rubber and tension of the rim differ in some types of diaphragms. They are available in about 20 sizes, 50 to 105 millimeters in diameters differing by 2½ mm. Sizes 70-80 mm accommodate most cases. The success in using diaphragm depends on selecting the right size and type according to the woman's anatomical requirements and how well she learns to use it. The correct size and type can be determined by bimanual vaginal examination. The length of examining finger from posterior fornix to the back of pubic arch indicates the diameter of the diaphragm. After the examination and selection of the right size and type of diaphragm the woman is taught to examine herself the lower edge of pubic arch, the feel of her cervix, the anterior vaginal wall and the little pocket or depression where arethra meets the bladder. The diaphragm is fitted by the physician and the patient is again made to feel the diaphragm in place, the front rim under the bony arch and the cervix covered with rubber. The patient

is made to remove the diaphragm by assuming any convenient posture and hooking the forefinger or middle finger under the front rim and pulling downward and outward. The patient is then made to introduce the diaphragm in the following steps:—

- (i) Rinsing the diaphragm in water.
- (ii) Holding diaphragm with the left hand with dome up. (Some prefer with dome down either position is equally effective).
- (iii) Application of a tea-spoonful of spermicidal jelly about two strips of one inch each to the side facing upwards which will be in contact with the cervix.
- (iv) Application of slightly less quantity about one strip of one inch to the other surface and spreading it, and a little of paste all round the rim.

- (v) Assuming any convenient posture—squatting, crouching, lying or standing with left foot elevated on a chair, stool or side of bed.
- (vi) Squeezing the rim between the middle finger and the thumb of the right hand and steadying it with forefinger.
- (vii) Separating the vaginal lips with left hand and inserting the diaphragm pushing it backwards along the floor of the vagina.
- (viii) Pushing gently the end that entered vagina first behind the cervix, the front end upward under the pubic bone. (The cervix may sometime obstruct its passage especially when it is long. The simplest way to overcome this difficulty is to pull the diaphragm out a little and then push it back on downward slope.)
- (ix) Checking it after insertion that the cervix is covered and the front rim is behind the pubic bone.



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in some diseases caused by large viruses and Rickettsia



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The correct size is one that fits snugly without pressure on the pubic or posterior fornix or vaginal wall and without any discomfort to the woman. Full rectum or bladder will interfere with correct fitting.

The diaphragm may be placed before retiring or before intercourse and left in vagina for eight hours after coitus as by that time all sperms are killed. No douche is then required. In case the diaphragm is removed before eight hours a douche of plain water or soapy water is required before and after removal of the diaphragm. The diaphragm is then washed with soap and cold water, dried powdered with talcum powder or French chalk and stored in a container in cool place. It can be tested every fortnight for holes by filling the cap with water or stretching and holding in front of diffused light. No greasy or oily substance should be used as it tends to shorten the life of rubber. In case the intercourse takes place more than one hour after the diaphragm and jelly are placed in the vagina or intercourse is repeated additional jelly should be applied.

The patient may be asked to practice fitting of the

diaphragm for a few days and come for check-up visit with the diaphragm in position. The subsequent check-up visit may be after one month preferably after menstrual period is over and after child birth.

The use of diaphragm is not suitable in cases of (i) torn perineum (ii) cystocele preventing the rim from remaining behind the symphysis (iii) short rigid flat anterior vaginal wall (iv) poor supra pubic edge (v) cervix pointing towards the pubic arch (vi) relaxation or stretching of the vagina as the result of labour or vigorous coitus.

Mechanical inserters are also available. They have notches to hold the cap temporarily. They are especially useful in cases of obese women, those with short fingers, or those with retroversion or acute ante flexion of the cervix. The inserter with the cap is gently pushed into the vagina as far back as it will go. By twisting the inserter the diaphragm is released. The inserter is then withdrawn. There is usually a blunt hook on the opposite end of the inserter which can be used for removal of the cap.

In case of relaxed vaginal walls or cystocele,

Matrisalus or Duraflex pessary may be tried. It has a S-shaped rim, like Hodges pessary, the upturned end keeps the sagging portion of the vaginal wall raised. It is introduced with the rounded end facing backwards. After the cap is pushed as far as possible into the posterior fornix the flat end is pushed up behind the symphysis. Findlays bow-bend hinged diaphragm may also be found useful in cases of relaxed vaginal wall.

- (4) *Cervical Caps*.—The cervical caps are intended to fit directly over the cervix. They are indicated in cases of healthy cervix projecting sufficiently on all sides, pointing towards the exit of the vagina, easily accessible by the women (as in case with retroversion of the uterus and in cervical ante flexion) and when the penis is not likely to dislodge it during intercourse. They are made of soft rubber, hard rubber, plastics, celluloid or metal.

The rubber cervical caps are available in various sizes. One type of cervical cap Mizpah has a detachable dome. The spermicidal jelly is applied to the rim and about $\frac{1}{2}$ tea-spoonful is placed inside the dome. In a convenient position (squatting or lying) the vaginal lips are separated with left hand, the cap is grasped between the index and thumb of the right hand and is pushed down and back as far as possible. When cervix is reached it is firmly pressed around the cervix. To remove the cap the finger is hooked on the rim. No attempt at pulling the dome or tag should be made as repeated pulling of the cervix may be harmful.

Hard rubber, metal and plastic caps are not commonly used. The advantage claimed is that it can be left on the cervix for a few days at a time and even between menstrual periods. This obviously will be possible in case of absolutely healthy cervix, and in cases where women can be kept under frequent medical examination (to ensure that there is no irritation) and where she can remove and introduce it to clean out any accumulated fluid as often as is necessary in her case. It is, however, desirable not to leave firm caps more than 24 hours. The woman should be taught to insert and remove the cap herself. The firm cervical cap partly filled with spermicidal jelly is held as a thimble on index finger or grasped with index finger and thumb with dome upwards. It is pushed deep into the vagina and then tilted and turned so that it fits over the cervix. The cap is removed in squatting or lying position by bearing

down and by passing the index finger over the rim and pulling it down.

- (5) *Dumas Caps*.—In cases where vaginal diaphragms cannot be used due to relaxed vaginal walls and cervical caps also are not considered suitable, Dumas caps may be tried. It is bowl-shaped with thick sides and thin centre and no metallic rim. They are available in four standard sizes. It is inserted by holding the sides of the cap together, with hollow facing upwards like rubber cervical cap and lies horizontally across vaginal vault and is held mainly by suction. The part facing vagina is pressed backwards until it gets into posterior fornix. It easily slips into place covering the cervix. The centre of the cap is then firmly pressed. It is removed by first breaking the suction by inserting the finger over one part of the rim. After thus dislodging the cap it is gently pulled out.

A combination of cervical and Dumas caps called Vimule is also used in United Kingdom. It is claimed to have a stronger hold than Dumas cap and can be used on longer cervixes.

- (6) *Chemical contraceptives*.—Chemical contraceptives include jellies, creams, suppositories and foam tablets and powders containing chemical agents which immobilize sperms. The chemical used should be non-toxic and vehicle should prevent leakage and permit spreading of spermicide over the cervix and vaginal walls. Certain chemical compounds used have been evaluated by the Council on Pharmacy and Chemistry of the American Medical Association. *New and Non-Official Remedies*, 1957 published by the Council mentioned the following which appear to be non-toxic when used in clinically tested formulations: Acetic acid (0.33 per cent), Benzalkonium chloride (0.1 per cent), Benzethonium chloride (0.2 percent), di-or-tri-isobutylphenoxy-polye-thoxyethanol (1 to 1.25 per cent), diethyl Sodium sulfosuccinate (0.25 per cent), Glyceryl monoricinoleate (1 to 1.5 per cent), Hydroxy quinine benzate or sulphate (0.02 to 1.15 per cent), Lactic acid (0.25 to 1.5 per cent), Monoisocyt

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phenylether (0.3 per cent). Phenyl mercuric acetate or nitrate (0.02 to 0.06 per cent), Ricinoleic acid (0.5 to 1 per cent), Sodium chloride (6 to 10 per cent), Sodium lauryl sulfate (0.2 to 0.5 per cent), Trioxymethylene (0.04 to 0.1 per cent), and Zinc phenosulfonate (0.5 per cent). It is now considered that hydroxyquinoline and hydroquinone are not harmless and should not be used as spermicidal agents.

Jellies and pastes are generally used with occlusive rubber caps. Therefore they should not contain greasy substances like lanolin or petrolatum as they cause deterioration of rubber. When occlusive caps with jellies and pastes are placed several hours before intercourse it is necessary to place additional quantity within one hour of intercourse with special applicators.

The applicator should be transparent, with blunted nozzle and unbreakable. The applicator should not be boiled. It can be washed with lukewarm soapy water after use and before filling it with jelly or cream. No air pocket should be left in the syringe. It is inserted gently as far as it can go easily (generally about 3-4 inches) while lying on the back. Then the plunger is pushed to expel the jelly.

Jellies and creams can be used without occlusive cap but such use will provide relatively less protection. There are jellies which claim that when used alone they provide high degree of protection. The usual dose is about 5 cc.

- (7) *Suppositories*.—Suppositories are placed in vagina with fingers about 15 minutes before intercourse to allow time for them to melt. They are not considered suitable for use in the tropics.

- (8) *Foam tablets*.—Foam tablet when used is moistened and immediately inserted as deep as possible in the vagina 3—5 minutes before it is needed. There are reasons to believe that chemical spermicides which have been used in contraceptives, jellies and creams for many years are as effective when used in foam tablets.

- (9) *Post-coital douches*.—Douches mainly attempt to remove the semen from the vagina. Their action is more mechanical than

chemical. The sperm travels at the rate of about one-eighth inch in one minute. If the semen is shed on or near the external Os (opening in the neck of the uterus) within a couple of minutes sperms can be out of reach of the douche. During ejaculation it is likely that some sperms may attach themselves to cervical mucus. During mid period of menstrual cycle the increased normal mucus of ovulation time is stated to be specially hospitable to sperms. Douche as a method of birth control therefore is very unreliable. The only place of a douche is as auxiliary to other methods or as a last resort in an emergency.

Douche when used should be done immediately after intercourse (except in case where occlusive cap with jelly has been used) and carefully. It is essential that the solution should be non-irritating and must distend the vaginal walls to open up all the folds where sperms are likely to be hidden. The vagina should be slightly distended and well flushed. If the ordinary douche can or bag is used it should be so kept that the top of its contents is about two feet from the entrance to the vagina. The douche can be taken with the labia kept compressed with thumb and fingers around the nozzle. The vagina can be thus slightly distended with solution. The fingers are released to allow the water to gush out. When using a bulb syringe the bulb should be compressed gently with the fingers only. If too much force is used the solution is likely to enter the uterus which is dangerous. It is also stated that frequent douching devitalises the vaginal flora (the so called Doederlein's bacillus).

The water for douching should not be cold. Ordinary tap water can immobilize sperms in a short time. Various substances are used mixed with water for douching for spermicidal property, like any of the following in a quart of water two tablespoonfuls of table salt, three tablespoonfuls of alum, one teaspoonful of lactic acid, two tablespoonfuls of lemon juice or vinegar or one tablespoonful of soap flakes.

Gentle scrubbing of the cervix and vagina with soap lather can be recommended as better than nothing.

Lysol, phenol, mercuric chloride and boric acid have also been used. These are not recommended, as concentrated solution containing them have caused a great deal of harm and even deaths.

- (10) *Sponges and tampons*.—Sponges and tampons are sometimes advised. Sponges are of rubber and marine. A piece of sponge or pad of wool or cotton able to cover the cervix used with spermicidal jelly or cream, or spermicidal solution or cooking oil (not mustard oil) have been suggested. Absorbent cotton is likely to be compressed to a very small size. A sponge two inches square and half an inch thick may fit a woman who has had no children but about double the size may be required after child birth. A general rule suggested is a sponge as thick as the thumb and two-thirds as large as the palm of the woman's hand. The cotton pad can be covered with thread tied in criss-cross manner or in a knitted bag.

Foam powders have been used. The sponge is dipped in water. The water is squeezed out and powder is sprinkled over the sponge before insertion. Sponges or tampons are carefully inserted in vagina as far as possible to cover the cervix and are removed eight hours after intercourse. Salt solution and foam powder were tried in some clinics in India but were found irritating and unacceptable.

Soap lather (not caustic soap) or one part of vinegar or lemon juice to eight parts of water (further diluted with water if found irritating) can be tried as experimental measure.

Sponge after use can be washed with soap and water and tampons can be used once only. The information available at present suggests that oil (olive oil or cooking oil not mustard oil) or approved jellies or cream may be non-irritating while used with sponges and tampons. No reliable information on their use and acceptability however is yet available.

- (11) *Safe period*.—A woman ovulates only once during her monthly menstrual period save in very exceptional cases. Ovulation occurs at a fairly definite time, some 13 to 15 days before the onset of the next menstrual period; ovum after release survives for only few hours (24-48 hours) unless it is fertilized, and sperms retain their capacity to fertilize the ovum for about 48 hours in the upper female passage. There are thus eight fertile days in a month—two days before the ovum arrives, the day ovum is released, three

days afterwards and one extra day for safety on each side. For example, if it is assumed that in a woman who menstruates every 28 days ovulation takes place 15 days before the onset of the next menstrual period, conception can occur from the 19th day to the 12th day, inclusive, before the onset of the anticipated menstrual period. Therefore these days are called unsafe days or baby days. The rest of the period is considered to be safe.

As a general rule conception is less likely to occur during the 7 days before the onset of menstruation than at other times in the menstrual cycle. In cases where previous menstrual records are not available abstinence from the 8th day of the cycle to the 22nd day, both days inclusive, may be advised. If the day of menstruation for a woman is on Monday the next Monday will be her first risky day, Monday following the risky day will be the most risky day and the Monday following the most risky day will be her last risky day. The period intervening between the first risky Monday and the last risky Monday will be the fertile period.

If the cycles are regular, calculation of the safe period is simple. But often they vary. These calculations are difficult, especially during puerperal, lactating and menopausal periods. Periodicity of menstrual cycles and therefore applicability of the rhythm method, can be disturbed by other factors like illness and emotional tension. The safe period method has, therefore, obvious limitations. Still it has its use. This method may be satisfactory for a woman whose periods are regular, whose safe periods have been carefully calculated (preferably with the assistance of a trained worker at a clinic) and who can properly follow it. The method may also be of value as a supplement to other contraceptive methods.

- (12) *Basal Body Temperature*.—Temperature method is also reported to be reliable means to find out ovulation time. It was observed that the temperature ranges between 97° F to 98° F during first two weeks of menstrual cycle, there is then a drop of 2/10 to 5/10° F then a rise from 1/2 F to 1° F on the following morning and subsequently about 98.4 to 99° F till the onset of the next menstruation. The rise from low to high temperature seems to correspond with ovulation time. But recent observations show that record of

Basal Body temperature is not a useful guide to determine fertile period.

- (13) *Coitus Interruptus (Husband being careful or withdrawal).*—This is possibly the oldest and most commonly employed method of birth control. The husband withdraws the organ before the ejaculation of semen is expected to occur. This method, however often fails to avert pregnancy because small amounts of pre-ejaculatory fluid containing sperms may flow throughout the sexual act without either partner being aware of it. Another drawback is that husband by reason of his constant nervous control to avoid ejaculation before withdrawal may become victim of anxiety state. Similarly wife due to anxiety of premature ejaculation or to not reaching orgasm may suffer from the same condition. Some have suggested that this method may also cause in males prostatic enlargement, congestion of the seminal vesicles, etc. This view, however, is not generally upheld. The main adverse effect on health of either partner should be looked in the nervous system.

While this method may have little to commend it has some advantages and need not be condemned out right. Many men have practised it some time or the other in their married life. Although pregnancies may have occurred despite the use of this method some pregnancies must have been avoided by the use of this method. Its use may therefore need not be discouraged amongst people on whom it imposes no strain or tension in either husband or wife. The limitation of the method should however be explained to them. It is obvious that this method should not be advised to those men who have no control or who have quick emission, or whom (or on their wives) it imposes conscious strain and tension and whose pre-ejaculatory fluid is known to contain active sperms.

- (14) *Coitus Reservatus (Holding back).*—After prolonged excitement the husband avoids reaching orgasm and ejaculation, the wife in the meantime may reach one or several orgasms. Here again nervous strain on the husband and presence of sperms in pre-ejaculatory fluids limit its effectiveness and the method cannot be recommended.

Some women also seem to consider that if they remain unconcerned during coitus and avoid reaching orgasm pregnancy can be prevented. This is obviously not true as ovulation occurs independently of coitus.

- (15) *Prolonged lactation.*—Some women are relatively protected during early months of lactation. The risk however exists. Breast feeding of a child does not ensure that pregnancy cannot take place.

- (16) *Intrauterine devices.*—Intrauterine stems, studs, Jewish bones, silk worm, silver rings and intrauterine injections of irritants have been used. High degree of protection have been claimed by use of Graffinbergs rings. These devices are considered dangerous. Serious bleeding, infection, cramps and deaths have been reported from the use of some of these methods.

- (17) *Heat to Testes.*—Temporary sterilization by applying heat to testes seems possible. It is found that if the temperature of the scrotum is raised (even by immersing it in warm water) by a few degrees, production of sperm is temporarily stopped, but the sperms lying in the epididymes are not thus effected.

- (18) *X-Rays.*—Application of X-Rays to the ovaries and testes have been tried. The dosage is too uncertain and the time of effect too unreliable hence this method has been given up.

- (19) *Spermatoxins.*—Injections of sperms or their components have been tried in experimental animals in the hope of producing immune substances which may react with sperms and destroy its fertilizing property. The results are not yet encouraging.

- (20) *Hormones ante-enzymes and antifols* — Investigations to find substances which may suppress ovulation, prevent fertilization or nidation of fertilized ovum in the uterus have been carried out for some time. The exact mechanism by which these act is not yet known. Hormones, antienzymes and antifols for conception control are still in the experimental stage. The harmful effects which may be caused by them are still not known in all cases.

Antifol compounds (which really lead to abortion) are very toxic and if pregnancy is not interrupted, serious embryological abnormalities are likely to occur in the child. These developments do indicate the possibility of producing a tablet or pill which may control conception. Recently two such pills have been reported. One pill has been reported by Sanyal from Pisum Sativum Linn (Matar dal) in India. Its active principle metaoxylohydroquinone is being tested under careful control at the All-India Institute of Hygiene and Public Health, Calcutta. The results so far are encouraging. Another pill containing a steroid has been reported in U. S. A. This has to be taken for 20 days in month. The clinical trials are still in progress.

It must be emphasized that however vivid may be the description of a contraceptive method, it lacks the information that can be gained only by personal instruction. A method suitable for a particular case can be learnt only at a family planning or gynaecological clinic, or from a qualified doctor who has had special training in the subject. A number of persons condemn one method or another. Some have lost complete confidence in clinical contraception. It is mainly due to faulty information, advice or instruction. Many women have been frightened by elaborate (some time quite incorrect) descriptions of the methods. An average woman needs gentle persuasion and advice to be given to her which is harmless, convenient and suitable to the resources at her disposal. A method convenient to a woman with the facilities of a bath room may be impossible for a woman who shares a single room with four others. Intelligence is also a factor to be taken into account. The fitting of a rubber cap may be easy for one but for another it requires great patience and repeated personal instruction.

14. *Sterilization.*—(i) The temporary methods of conception control are undoubtedly important. But after the parents have already had sufficient number of children and do not want any more or when further pregnancy is hazardous to the health of the mother, sterilization seems to be the solution. The operation can be performed either on the male (bilateral vasectomy) or on the female (bilateral salpingectomy). The transmission of sperms in the case of the former and ova in case of latter is prevented by blocking the passage conveying them. According to available evidence either of these operations cause no disability

except that of rendering their person sterile. Sex function is not disturbed.

No sex gland is removed. There is no decrease in sex desire, enjoyment, potency, or staying power. There is no disturbance in hormonal balance. The psychological disturbances which have been reported in cases sterilized are not due to operation, but due to unstable psychological make-up of the person concerned.

It is not necessary for both husband and wife to be sterilized, either husband or wife may be operated. After vasectomy the ejaculate is slightly diminished but this is not noticeable. According to animal experiments carried by Ancel and Bouin and Steinach theoretically sexual desire increases after vasectomy. This does not seem to be so in practice. The increase of desire may be psychological due to release of fear of pregnancy. For all practical purposes both operations are irreversible at present. Reversal operation have been attempted. Success is still limited to small number of cases. Vasectomy is simpler of the two operations :—

- (a) *Vasectomy.*—Vasectomy is a very simple operation and is performed under local anaesthetic. A small incision is made in the skin of the scrotum. The tubes called the vas deferens which convey sperms from the testes are excised to the extent of about half an inch and ligatured. The sperms are thus prevented from reaching the seminal fluid. The operation is completed within about 20 minutes. The person is not confined to bed for a single day. He is just required to avoid lifting weight or drive a car shortly after operation. The person operated can return to work after a week's rest at home.

- (b) *Salpingectomy.*—Salpingectomy in the woman is an abdominal operation generally performed within a few days after delivery, when the woman is in hospital. The uterus and appendages have not descended into the pelvis during this period. The operation may be done under local, spinal or general anaesthesia. A small portion of the tubes which convey the ovum from ovaries into uterus are ligatured and cut. Prolonged hospitalization or rest at home is not required. The operation can be done also at any other time except

during pregnancy, *e.g.*, during other operations either abdominal or through the genital passage.

Surgeons adopt different techniques of operation. Simplified techniques of sterilization like cauterizing electrically the point where Fallopian tubes enter the uterus have also been tried. Failures in operation seem to be mainly due to faulty techniques.

(ii) *Aim of sterilization.*—The practice of sterilization may be considered to achieve the

(a) Reduction of population.

(b) Prevention of—

(i) *Sickness or even death* where use of contraceptives may leave an undesirable margin of danger.

(ii) *Inheritance of physical and mental defects.*

(iii) *Birth of children to persons who are feeble minded, mentally abnormal or suffering from other diseases or where the father or the mother or both are considered*

incapable of adequately providing for, educating or bringing up their offspring.

(iv) Further deterioration of the socio-economic position of an already too large a family.

15. *Legal.*—Law in India does not seem to forbid the sterilization operation provided it is performed with the valid consent of the persons concerned who should be explained that it is an irreversible operation. For all cases who can give valid consent, no legislation may, therefore, be required. A signed declaration from both the husband and the wife stating that they agree to the operation and fully understand the position and the consequences may be a sufficient legal protection for the surgeon against a criminal prosecution or a legal action for damage.

16. *Place for operation.* The doctor who performs the operation must have the necessary practical training and experience. It should be performed in places, where such facilities exist. Both these conditions are generally satisfied in hospitals. The operation should therefore be performed in such institutions and not in family planning clinics. Its indiscriminate use (or abuse) is wrong, will bring disrepute to and adversely affect family planning programmes and may lead to other complications.

List of Contraceptives

CATEGORY I

Name	Manufacturer/Importer	Spermicidal Agent
JELLIES AND PASTES		
Preceptin	Ortho Products, Raritan, N.J., U.S.A. (Ortho Pharmaceuticals, Imperial Chemical Industries (India), Private Ltd., P.B. 310, Bombay-1).	P-Diiso Buty-l phenexy polyethoxy ethanelrichineleic acid.
Cooper Creme	Whittaker Laboratories INC. 898 Washington Street, Peekskill, New York (Dr. Jai Singh's Son & Co., Private Ltd.), 18/4 Asaf Ali Road, P.O. Box 45, New Delhi.	Trioxymethylene 0.04% Sodium Oleate 0.76%
FOAM TABLETS		
Contab (Formula IV)	Smith Stainstreet & Co., Ltd., Chloramine-T, Calcutta.	50 nP. for 12 tablets.

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pharmaceutical pedestal and confers the top rank and pride of place in the line of treatment of iron deficiency anæmias.

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Name	Manufacturer/Importer	Spermicidal Agent	
Durafoam	Durax Products INC. 684 Broadway, New York 12, N.Y. Beddle Sawyer & Co., (India) Private Ltd., 25, Dalal Street, Fort Bombay-1.	3½% P-Triiso-propylphenexy-ethanel 0.1% P-propylhy-drox-ybenzoate.	
Planitab	Hind-Chemical Ltd., Sircar Road, P.B. 227, Kanpur.	Pyridine mercuric chloride.	94 nP. for 12 tablets.
Tampoon%	Nipon Eisai Co., Ltd., 88 Jakenhayache, Bunkye Ku. Tokyo, Japan (Shah & Jani C/O Andre Laboratories Aidun Bldg., 1st Dhobitaloa Lane, Bombay 2).	Phenylmercuric acetate.	Rs. 1.50 for 16 tablets.
Volpar*	British Drug Houses, London (British Drug Houses (India), Private Ltd., Imperial Chemical House, Bombay-1).	Phenylmercuric acetate.	Rs. 1.10 for 24 tablets.

% As the foam produced with one tablet seems to be insufficient, hence two tablets instead of one are advised.

* Storage quality reported to be unsatisfactory for the presents.

CATEGORY II

Name	Manufacturer/Importer	Spermicidal Agent
FOAM TABLETS WHICH SATISFY KEEPING QUALITIES FOR UNSEALED TUBES AT 89% HUMIDITY FOR 3 MONTHS		
Durafoam	Durex Products INC. 684 Broadway, New York 12, N.Y. (Beddle Sawyer & Co. (India), Private Ltd., 25 Dalal Street, Fort, Bombay-1)	3½% P-Triiso-propylphenexypoly-ethoxy-ethanel. 0.1% p-propyl-hydroxybenzoate.
Contab (Formula IV) tablets	Smith Stainstreet & Co., Ltd., 18 Convent Street, Calcutta	
Mycone	Allied Laboratories, Ltd., 140 Part Lane, London, WI. (Dr., Jai Singh's Son & Co., Private Ltd., 18/4 Asaf Ali Road, P.O. Bcx 457, New Delhi.)	Phenylmercuric acetate.
Sampoon	Nipon Eisai Co., Ltd., 88 Jakenayache, Bunkye Ku, Tokyo, Japan (Shah & Jani C/O Andre Laboratories, Aidun Building, 1st Dhobitalao Lane, Bombay-2).	Phenylmercuric acetate

RUBBER & PLASTIC APPLIANCES

Name	Manufacturer	Importer
OCCLUSIVE CAPS DIAPHRAGMS		
1. Dutch Dumas type (5 sizes), Cervical	Lamberts (Dalston) Ltd., 200/2. Queens-bridge, Road, Dalston, London, E. 8.	M/s. British Drug House (India), Private Ltd., Imperial Chemical House, Bombay.
2. Dutch Caps (Durex) flat or spiral spring	London Rubber Cop., Hall Lane Ching-ford, London, E. 4	M/s. British Drug House (India), Private Ltd., Imperial Chemical House, Bombay. Rs. 2.45 each.
3. Cervical (Check Caps Pessaries Durex).	London Rubber Cop., Hall Lane Ching-ford, London, E. 4.	M/s. L. D. Seymour & Co., Ltd., Mere-weather Road, Appollo Bunder, Bombay.
4. Vaginal Diaphra-gms, latex spiral spring (Dutch cap type).	Ortho Pharmaceutical Ltd., Lane end, High Wycombe, Bucks, England.	M/s. Imperial Chemical Industries (India), Private, Ltd., P.B. 710, Bombay-1. Rs. 3.00 each.
5. Plastic caps, Du-mas type (5 sizes).	Lamberts (Dalston), Ltd., 200/2, Queens-bridge Road, Dalston, London E. 8.	M/s. British Drug House (India), Private Ltd., Imperial Chemical House, Bombay.
6. Vaginal Diaphra-gms latex spiral spring (Dutch cap type) "Prencaps" (Dumas type) "Cervical Cap Coroap" cavity rim, seamless Dome.	Prentif Ltd., Long's Court, St. Martin's Street, London W. C. 2.	M. Valab & Co., Botawal Chambers, 4, Sir P. M. Road, Fort, Bombay-1.
7. Durex	Durex Products, 684, Broadway, New York, 12, NY., U.S.A.	M/s. V. Sharma & Co., Behind State Bank, Chandni Chowk, Delhi-6.
8. Koromex	Holland Randoz Corp., New York, U.S.A.	Herbans Ltd., Prospect Chamber, Hornby Road, Bombay-1.
9. Kemi	Kemi Products Corp., N. J., U.S.A.	Bombay Surgical Co., Charni-Road, Bom-bay-4.
10. Check Pessaries	Rubber Industries (India), Ltd., 243, Abdul Rehman Street, Bombay-3.	
11. Cooper	Whittaker Laboratories Inc., 898, Washing-ton Street, Peekskill, New York.	Dr. Jai Singh's Son & Co., Private Ltd., 18/4, Asaf Ali Road, P.O. Box 457, New Delhi. Rs. 2.75 nP. each.

Name	Manufacturer	Importer
CONDOMS AND WASHABLE SHEETS		
1. " Protectives " Transyl, Silvine and Lion.	London Rubber Co., Ltd., Hall Lane Chingford, London E. 4.	M/s. L.D. Seymour & Co., Ltd., Mereweather Road, Appollo Bunder, Bombay.
2. Codoms and washable Sheaths'	Prentif Ltd., Long's Court, St. Martin's Street, London, W.C.2.	M. Valab & Co., Botawala-Chamber, 4, Sir P.M. Road, Fort, Bombay-1.
3. Durapac	Durex, England	L. D. Seymour & Co., Appollo Bunder, Bombay-1
4. Gold Coin	Watch & Co., Ltd., Japan	Bhogilal Premchand & Co., 24, Princes Street, Bombay.
5. Rex	Aarhus Cummivare Fabrik, Ltd., Denmark.	Dr. Jai Singh's Son & Co., Private Ltd., 18/4, Asaf Ali Road, P.O. Box 457, New Delhi.
6. Regard	Do.	Do.

N.B.—Many other contraceptives and family planning appliances have been provisionally approved. Informations regarding them may be freely had from your Family Planning Centre or Clinic.

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Northern Railway Hospital, Allahabad

By Dr. J. R. Gadeock
Divisional Medical Officer, Allahabad.

ALLAHABAD Railway Hospital has been in existence only since 1924, when the first foundation stone for a 20 bedded Hospital was laid by Sir Harry G. Walters, the then Chief Medical Officer of ex-East India Company Railway in March 1924. Prior to that there was only an Out-Patient Dispensary at Allahabad to cater to the needs of Railway employees. 13 years later, the necessity arose for extending the Hospital and a foundation stone for an additional wing was laid by Sir H. Suhrawardy, the then Chief Medical Officer of East India Railway in April 1937. Cottage wards and a separate Radiology and Operation Theatre wing were added a few years later. Till the year 1949, the total bed strength of the Hospital was only 47. By rearranging the accommodation available the bed strength was raised to 62 by the end of 1951, and to 72 by the year 1955-56. In January 1957, further 20 beds were added by taking over the nurses' residential wing by offering alternative housing accommodation to the nurses outside the Hospital. Thus the bed strength was raised to 92 beds. The demands on the indoor beds became so great by the middle of 1959 that 8 more beds had to be added by providing 2 beds in each cottage ward instead of one bed. The present bed strength of this Hospital is, therefore, 100 beds since October 1959.

This is, therefore, not a big Hospital as some of the latest and more modern railway Hospitals go, but this Hospital has had its importance in many ways. The office of the Chief Medical Officer, ex-East Indian Co. Railway was located in this Hospital and had shifted to Calcutta only in the year 1927. There was also an organisation of Central Medical Stores Depot for East Indian Co. Railway located in this Hospital. The first water analysis, chemical and bacteriological laboratory for the whole of the East India Co. Railway was started in this Hospital, and even now this laboratory is serving the whole of the Northern Railway. It still maintains a Central Mela stores and supplies fully equipped Mela boxes to all Divisions, specially, the three Northern Divisions of the ex-East India Railway, viz., Allahabad, Lucknow and Moradabad. The first Anti-rabic centre was also opened in this Hospital on the ex-East India Co. Railway and at one time was the only centre in

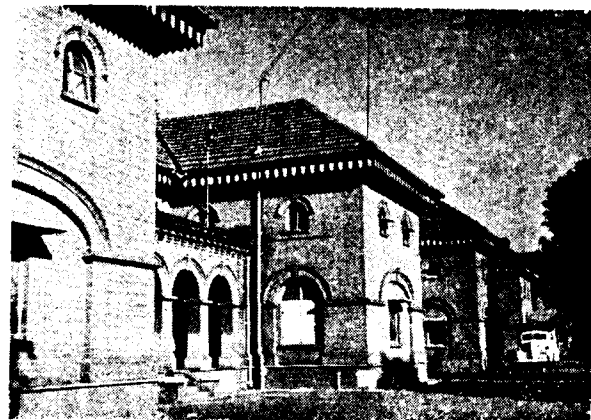
the city of Allahabad and catered to the needs of civil population also.

In the early days, it was not the policy of the Railway Administration to provide all medical facilities to railway employees and their families and cases requiring major surgery and other specialised treatment were referred to Civil Hospitals or nearest Medical College Hospitals. After independence of the country, however, and with the advent of era of planning, the Railway Board accepted most of the recommendations of Chief Medical Officers' Conference held from year to year. The necessity for extending medical facilities to railway employees and their families is being increasingly recognised and implemented. Allahabad Railway Hospital has had its share of increase in facilities also in the shape of a Chest Clinic for T. B. patients, a Dental Clinic with Honorary Dental Specialist, an Eye Clinic with a whole time Asstt. Surgeon with specialists' qualification in eye diseases, a Ladies' Out-patient Clinic with a wholetime Lady Asstt. Surgeon, and the creation of a post of Asstt. Medical Officer in class II to assist the Divl. Medical Officer in his multifarious duties and responsibilities.

During the past three years, this Hospital has made rapid progress not only with regard to extra facilities provided to staff in the way of great increase in the number and quality of drugs supplied and additional equipments for the various departments of the Hospital, but also in the amount of work done in the various departments of this Hospital, which has risen out of all proportion to the additions to the strength of medical staff. This will be revealed by the comparative figures showing the activities of each Department for the year '56—57, '57—58, '58—59 & 59—60.

I. OUT-PATIENT DEPARTMENT

Additions and alterations to the existing building were made in order to provide accommodation for the Ladies' and Children's Out-Patient Department created since 3.3.58, Dental Clinic, eye clinic and a separate accommodation for Asstt. Surgeon (Line)/Allahabad. A separate waiting room for ladies and children is under construction. The amount of work done in the Out-



Indoor Wards.



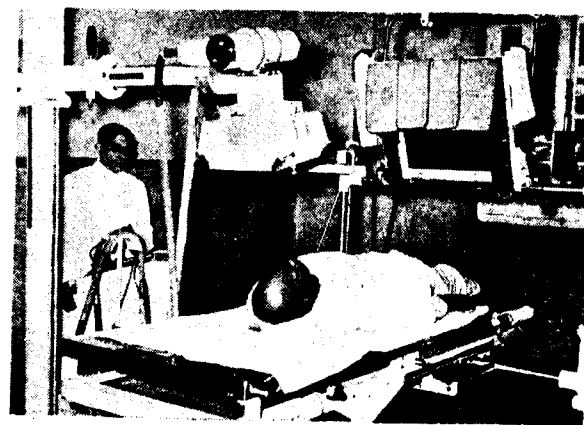
Cottage Wards.



Operation Theatre
(Operation in Progress)



Pathology Laboratory.



X-Ray Department.



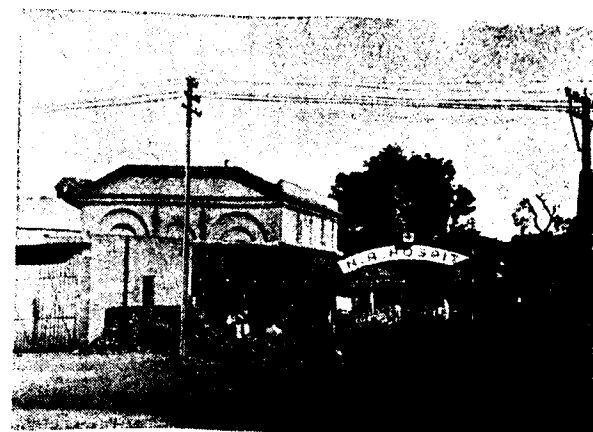
Medical Male Ward.



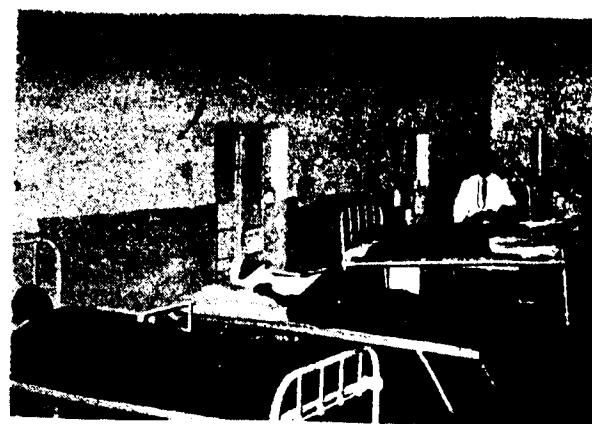
Patients' Recreation Room.



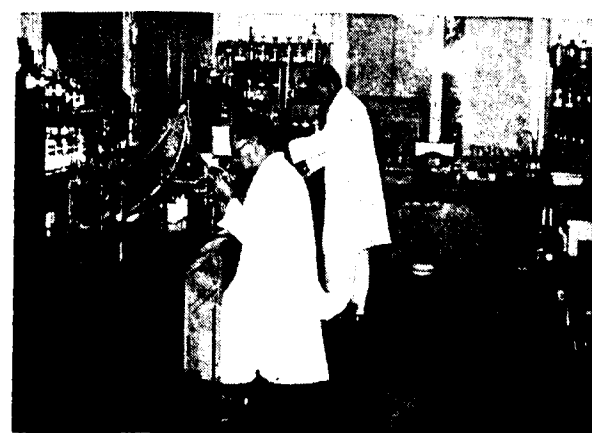
Queue before Dispensing Window.



Out-Patients Department.



Surgical Male Ward.



Chemical Laboratory.



Queue before Doctor's Examination Room
Out-Patients' Department.

Patient Department for the four years: 1956—57, percentage of increase in work as compared with '57—58, '58—59, & 59—60 is given below. The 1956—57 as base year, is also given against each figure :

I. Outdoor patients treated	56—57	57—58	Percentage increase over 56—57	58—59	Percentage increase over 56—57	59—60	Percentage increase over 56—57
(a) Employees (new & old)	32080	45428	+41.6%	59933	+86.82%	59743	+86.23
Families (Do)	32457	47909	+47.60%	70552	+117.37%	93672	+188.80
(b) Outpatients (new) both employees & families.	27971	36669	+31.09%	46194	+65.14%	54547	+95.01
(c) Outpatients (new & old) both amongst employees & families.	64537	93337	+44.62%	130485	+102.17%	153415	+137.71

II. IN-PATIENTS DEPARTMENT

The 100 beds provided for in-patients are divided as follows :—

(e) Eye beds	4
(f) T. B. Beds—(Male)	8
(g) T. B. Beds—(Female)	2
(a) Medical and Surgical general beds—(Male)	44
(b) Medical, surgical and gynaec beds—(Female)	20
(c) Maternity beds	10
(d) Cottage ward beds	12

The demand for indoor beds, however, always exceeds supply and additional beds have to be provided in the Hospital varandahs, in order not to refuse admission to any deserving case. Bed utilisation during 1958—59 was a little over 100%. The amount of work done in the In-patients' Department for the four years: 1956—57, '57—58, '58—59 & 59—60 is given below :

Indoor patients treated (new).	56—57	57—58	Percentage increase over 56—57	58—59	Percentage increase over 56—57	59—60	Percentage increase over 56—57
(a) Employees	1187	1786	+50.46	1764	+48.60	1800	+51.64
(b) Families	1150	1636	+42.26	2121	+84.43	2263	+96.78
(c) In-patients treated (new) both employees and families.	2337	3422	+46.42	3885	+66.23	4063	+73.85
(d) No. of operations performed : Major	33	85	+157.87	204	+518.18	232	+603.03
Minor	575	610	+6.08	628	+9.21	826	+43.51
(e) No. of confinements done in the Hospital.	192	213	+10.93	277	+44.27	336	+75.00

Major operations of all types consistent with the equipment and assistance available were performed, and considerable amount of extra operation theatre instruments, equipment and appliances have been provided during the last three years. It is also worth mentioning that the Operation Theatre is air-conditioned, so that operations can be performed throughout the year.

III. RADIOLOGY AND ELECTRO-THERAPY DEPARTMENT

The X-Ray Department is quite well equipped and all types of X-Ray examinations are undertaken.

Equipment consists of 100 M. A. X-Ray plant, Short Wave Diathermy apparatus, Ultra-Violet and Infra-Red apparatuses and Current Therapy apparatus. A portable 50 M. A. X-Ray unit has been received recently. During 1958—59 a refrigerated unit for developing X-Ray films had been installed, so that there is no necessity of getting ice from outside for developing X-Ray films during summer. An Adelca Camera unit has been received for mass miniature radiography for T. B. survey of Railway population. Work done in this Department has shown great progress in the last three years. Comparative figure for each type of work is given below: yearwise :

(a) No. of X' Rays done for :	56—57	57—58	Percentage increase over 56—57	58—59	Percentage increase over 56—57	59—60	Percentage increase over 56—57
Employees	831	1149	+38.26	1255	+51.02	1519	+82.79
Families	464	878	+89.22	1029	+121.76	1266	+172.84
(b) No. of skiagram done for both employees & families.	1295	2027	+63.7	2284	+86.38	1785	+115.05
(c) No. of cases of screening (both employees & families)	398	824	+107.0	1351	+239.4	1649	+314.31
(d) No. of electro therapy given including Infra-Red, Ultra violet and current therapy.	1554	1958	+26.38	1703	+9.58	2120	+36.42

IV—CENTRAL CHEMICAL LABORATORY

This laboratory is one of the oldest and it caters to the needs of all Divisions of this Railway. All types of food, water analysis and some biochemical investigations are done in the Chemical section. In Pathological and Bacteriological section, all types of serological, bacteriological, haematological and routine work of sputum, blood and stool examinations are done. Specimens are received from all over this Railway.

	56—57	57—58	Percentage increase over 56—57	58—59	Percentage increase over 56—57	59—60	Percentage increase over 56—57
(a) Food Analysis	757	774	+2.24	793	+4.75	915	+20.87
(b) Water Analysis	323	254	+21.36	271	+16.09	426	+31.88
(c) Other examinations	543	452	+16.75	718	+32.22	543	Nil
(d) Urine	3018	4320	+41.81	4950	+64.01	6200	+105.41

	56—57	57—58	Percentage increase over 56—57	58—59	Percentage increase over 56—57	59—60	Percentage increase over 56—57
V—CENTRAL PATHOLOGICAL & BACTERIOLOGICAL LABORATORY							
(a) Blood Examination	7826	13346	+ 70.53	12967	+ 65.06	18794	+140.14
(b) Sputum – do –	818	894	+ 9. 3	1164	+ 42. 3	1234	+ 50.85
(c) Stool – do –	865	1203	+ 39. 0	1125	+ 30. 0	1137	+ 31.44

During the course of 1958—59, some additional equipment like photoelectric colorimeter, has been received for the laboratory and it is hoped that as soon as the necessary chemicals indented are received full Blood Chemistry work would be undertaken at the Central Laboratory of this Hospital.

VI—CHEST CLINIC

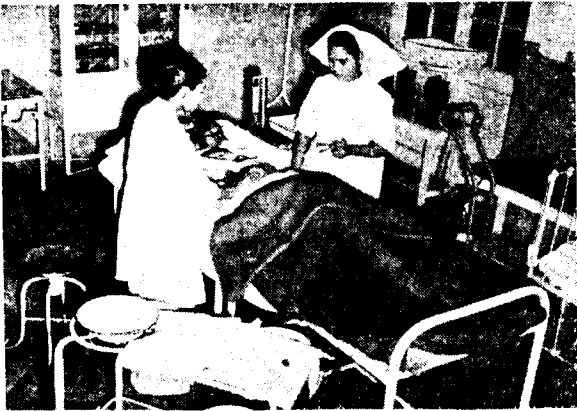
Chest Clinic was started on 21-5-56. 10 indoor beds—8 for males and 2 for females are attached to the Chest Clinic.

	56—57	57—58	Percentage increase over 56—57	58—59	Percentage increase over 56—57	59—60	Percentage increase over 56—57
(a) No. of new cases suffering from T. B. amongst employees detected.	52	84	+ 61.53	187	+259.61	157	+201.92
(b) No. of T. B. cases amongst families.	26	72	+176.92	146	+461.53	150	+476.80
(c) Total no. of new cases both amongst employees and families & children detected and treated in the Chest Clinic.	78	156	+100.00	333	+326.92	307	+293.58
(d) All old & new cases receiving treatment at the Chest Clinic.	198	221	+ 11. 6	349	+ 76.26	418	+111.11
(e) No. of employees admitted in Rly. Reserved beds in various sanatoria.	8	3		39		60	

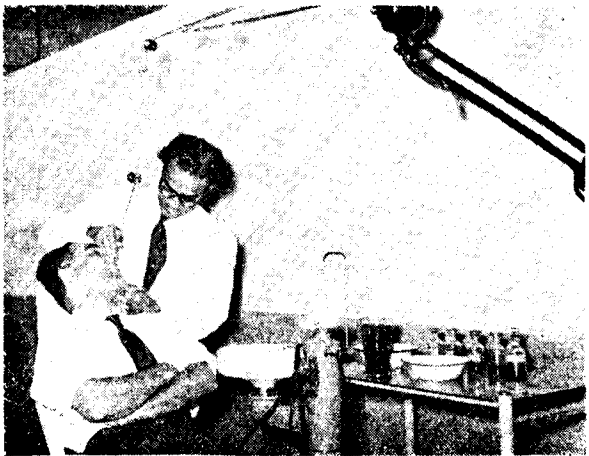
VII—DENTAL CLINIC

is as follows :

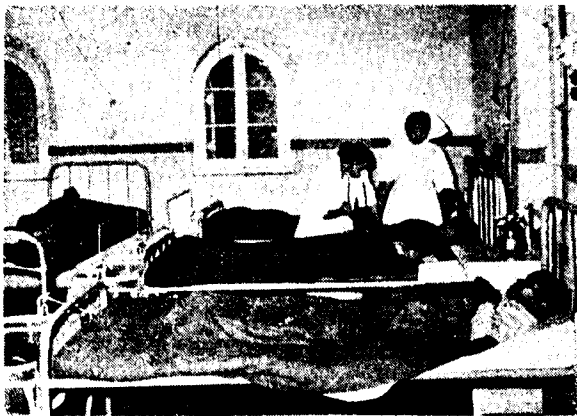
Dental clinic was started at this Hospital on 24-6-57. The amount of work done for the three calendar years from 24-6-57 to March 60	Upto Dec. 57	665
	From Jan. 58 to Dec. 58	1665
	From Jan. 59 to Dec. 59	1881



Labour Theatre.



Dental Clinic.



Maternity Ward.



Plaster Room.

Scaling, Cleaning, filling, extraction and gum treatment is done at the Dental Clinic free of charge for class III & IV employees and their families. The clinic is under the charge of an Hony. Dental Surgeon who attends for 2 hours daily, except on Sundays.

VIII—EYE CLINIC

The post of whole time specialist Eye Surgeon (Asstt. Surgeon) was created and filled on 20-9-58. The amount of work done at the Eye Clinic is as follows :

From Oct. 58 to Dec. 58	674
From Jan. 59 to Dec. 59	3278
From Apr. 59 to Mar. 60	3683

No. of eye operations from : Oct. 58 to Dec. 59

Major	49
Minor	305
Oct. 58 to Dec. 59	
No. of refractions done and glasses prescribed	866

IX—SPECIALISTS SERVICES

All railway cases requiring specialists' services and consultations and advice or investigations which are not available in this Hospital are referred to special institutions recognized for this purpose and to the Central Railway Hospital at New Delhi, where services of such specialists are available. Cases of advanced cancer, cases of Poliomyelitis and its sequelae, cases requiring radium, deep X-Ray therapy or Radio active cobalt radiation, mental disease cases,

leprosy cases and cases requiring operations, like, Neuro and Thoracic surgery and ear and nose surgery etc. are being referred to these institutions.

X—ANTI-RABIC CENTRE

Anti-rabic centre exists in this Hospital ever since the first Dispensary was opened at this station. Large number of dog bite cases from Allahabad and in the Division excluding Tundla and its sub-districts are treated in this centre. Anti-rabic treatment is also given to railway employees and their families free of cost for cases of bites by monkeys, jackals and other rabid animals. The total number of railway patients treated at this centre for four years is as follows :

56—57	57—58	58—59	59—60
153	120	145	160

XI—DRUGS STORE

This Hospital is fortunate in having adequate supplies of all types of drugs including patent medicines and anti-biotics which are supplied free to all railway employees and their families, and dependents entitled to free treatment. It can be confidently stated that not a single Naya Paise's worth of medicine prescribed is required to be purchased from outside by any railway employee, his family or dependent. Expense of drugs has risen from Rs. 48,000 in 1956—57 to over Rs. 1,30,000 during 1959—60.

MELA STORES

Extra equipment and drugs are stocked in this Hospital for use during important Melas in this Division as well as in the adjoining Divisions of Lucknow and Moradabad. This is stored in the form of Mela boxes containing standardized equipment and drugs. This is to be used at the First Aid Posts during Mela time.

XII—DIET FOR INDOOR PATIENTS

All class IV & III staff drawing pay upto Rs. 130/-p. m. and for T. B. cases upto Rs. 300/- p.m. are allowed free diet in the Hospital from Revenue. From the Staff Benefit Fund families of class IV staff and wives of class III staff drawing pay upto Rs. 150/- p.m. are allowed free diet. The diet supplied is wholesome and nourishing and the diet is inspected every day by the doctors and the Matron. Milk supply is from Co-operative Milk Supply Union,

Allahabad. Both types of cooks are employed, viz., for vegetarian and non-vegetarian patients.

XIII—AMBULANCE CAR

An ambulance car with two wholetime drivers and a cleaner is sanctioned for this Hospital and the services of ambulance are freely available at all hours of day and night to all deserving cases requiring admission in the Railway Hospital and in special cases for transport to other Hospitals in the city or return to their houses.

XIV—AMENITIES PROVIDED FOR INDOOR PATIENTS

The following amenities have been provided for the welfare and recreation of indoor patients :

1. Free supply of newspapers and periodicals.
2. Indoor Recreation Room has been provided with a Radio set and an extension loud-speaker for cottage wards, indoor games, like, Carrom, playing cards, chequers, snakes and ladders etc.
3. There is a small library of books and pictorial magazines for the use of patients.
4. Water cooler has been installed in the In-patient Department for the facility of patients for supply of cool drinking water during summer.

XV—BLOOD TRANSFUSION SERVICES

All cases requiring major surgery are given blood transfusion—the same is being arranged through local Blood banks. The cost is borne by the Administration.

XVI—ARTIFICIAL LIMBS

All amputees including cases amongst families whether injured on duty or otherwise are provided with free artificial limbs from the Staff Benefit Fund on recommendation by the Divl. Medical Officer. Artificial limbs are being arranged through Artificial Limb Centre, Poona under the Ministry of Defence.

XVII—FAMILY PLANNING CLINIC

A Family Planning Clinic has been recently

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Vitamin A	20,000 I.Us./Gm.
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sanctioned by the Chief Medical Officer for this Hospital. Indent has been placed for the necessary equipment and appliances for the same and it will start functioning as soon as equipment and appliances are made available.

XVIII—CASUALTY DEPARTMENT

A Casualty Department has been sanctioned recently. One doctor, one nurse and a compliment of class IV staff would be on duty all the 24 hours to attend to emergency cases, beyond outdoor dispensary hours.

XIX—STRENGTH OF MEDICAL STAFF

Comparative figures of sanctioned strength of

Medical staff for this Hospital of all classes is given below yearwise :

	1956—57	1957—58	1958—59	1959 -60
Class I	1	1	1	1
Class II	—	—	1	1
Class III	44	45	46	46
Class IV	74	85	85	85

From this it would be apparent that although work done in this Hospital has increased tremendously during the last three years, yet there has not been a proportionate increase in the strength of staff.

MILLING CUTTERS

The Indian Standards Institution has prepared two draft standards, one for General Requirements for Milling Cutters [Doc: EDC 45(535)] and the other for Dimensions for Milling Cutters [Doc: EDC 45(534)]. These will be circulated shortly to the interests concerned for their critical comments and suggestions for improvement. These draft standards form part of a series of Indian Standards for small cutting tools which the Institution is preparing in connection with the changeover to the metric system.

HEALTH'S

ZYMOTONE

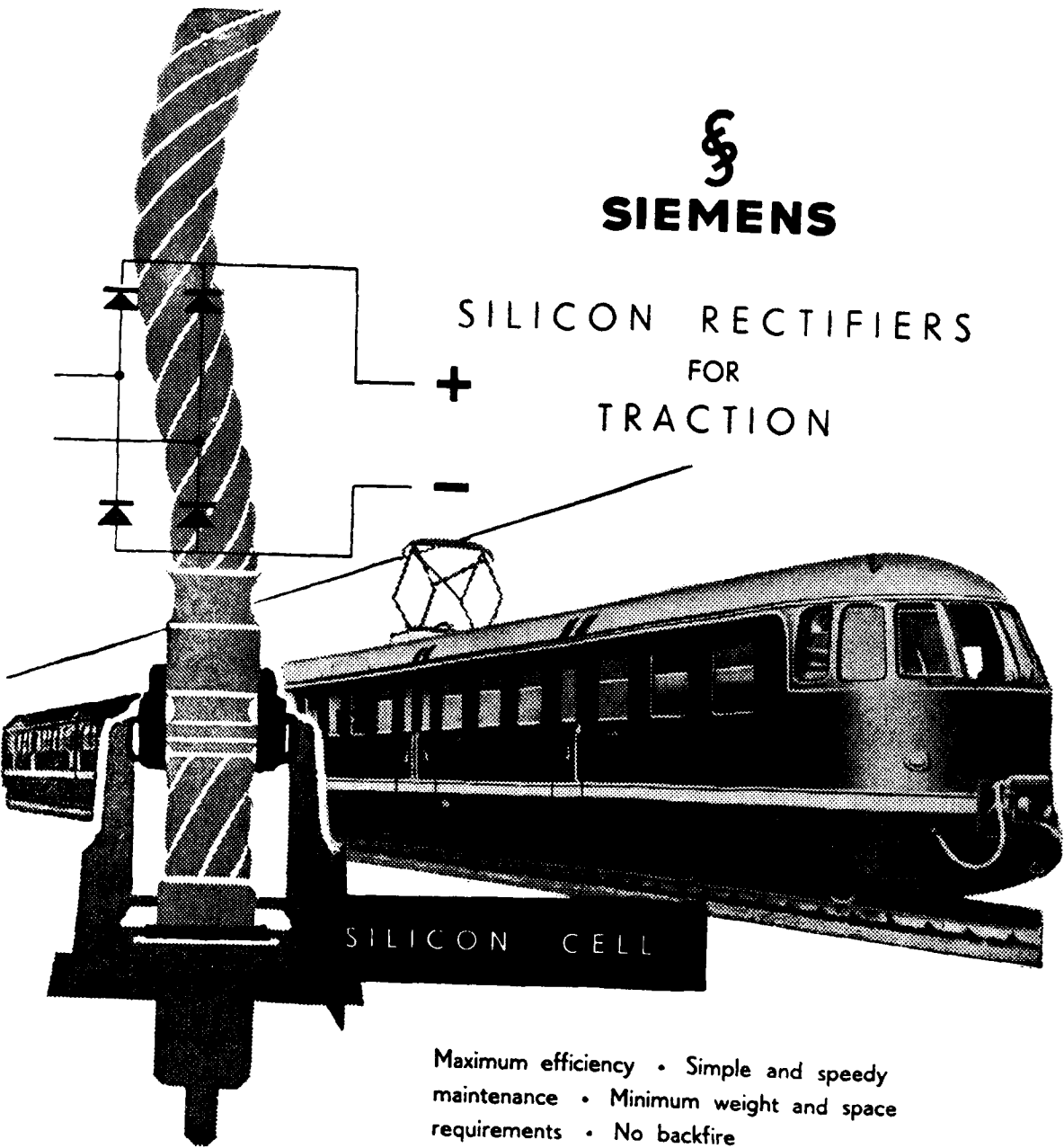
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Integral Coach Factory begins Year 1960 by Crossing the 1000th Coach Mark

By K. G. Hiranandani

Chief Administrative Officer, Integral Coach Factory

SINCE October 1955, when INTEGRAL COACH FACTORY near Madras first stirred into productive life, its story has been one of continuous development, rapid progress and impressive achievements. Starting with the assembly of Coach Shells from imported components, this factory has repeatedly beaten its targets, has successfully surpassed its capacity turnout rate of a coach shell every 6 working hours, and is now producing about 40 Coach Shells per month, with about 95% Indian made components.

This year 1960 started with a special significance when Integral Coach Factory ceremonially rolled out from its works the 1000th coach almost a year ahead of original production schedule.

THE SHELL UNIT

This Unit of the Integral Coach Factory, set up to attain self-sufficiency in the matter of coaches, has produced in its first, second, third and fourth production years, 43, 150, 308 and 423 Coach Shells respectively, much more than the original targets. The comparison of targetted and actual outturn is given below :

Production Year	Original target	Revised target	Actual output
1. (Oct. 55-Sept. 56)	20	40	43
2. (Oct. 56-Sept. 57)	100	120	150
3. (Oct. 57-Sept. 58)	200	240	308
4. (Oct. 58-Sept. 59)	300	350	423
5. (Oct. 59-Sept. 60)	350	350	530*

* Anticipated

To meet the increasing requirements of coaching stock during the third five year plan, it has been decided to increase further the production capacity of this Unit to about 700 coaches per annum by working double shift.

The efficiency of the shops, has been increasing from year to year as the men have been gaining skill and experience. The man hours spent on each coach have come down steadily from about 19,600 at the start of production to about 8,500 at present. It is expected that there would be further improvement with the incentive system of payment which has been introduced recently.



Shri K. G. Hiranandani, Chief Administrative Officer, Integral Coach Factory.

The production costs have also been coming down. The cost of a coach shell produced in the Factory has come down sharply from initial Rs. 186 thousands to Rs. 82 thousands inclusive of all overheads and depreciation. The ex-works cost of a similar coach, imported from Switzerland, was about Rs. 107 thousands while its landed cost in India including freight, was Rs. 187 thousands. Thus a saving of nearly Rs. 105 thousands per coach shell over the imported one has been achieved.

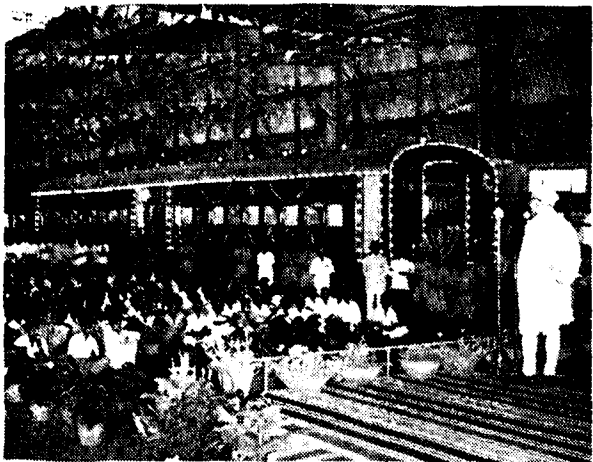
THE FURNISHING UNIT

The original intention was that this Integral Coach Factory would produce only Shells while they will be furnished in the Railway Workshops. Due, however, to the impact of the second plan, it has since been finally decided to furnish all the shells in

the factory itself. A separate furnishing unit, therefore, with a project cost of Rs. 3.69 crores is being set up in close proximity to the shell unit.

The construction work for this furnishing unit is already in hand. All land required has been acquired and a two mile long railway siding, leading from Villivakkam Railway Station, and connecting the shell unit, has been completed and brought into use. Ancillary works such as roads, compound wall for the factory, the works entrance, the Electrical receiving station and its power supply connection, have been completed. The pipe line required for water supply to the new factory has also been laid. The construction of a 3 lakh gallon capacity, underground reservoir and a 2 lakh gallon capacity overhead tank is in hand. Side by side, the construction of the Main Works Office is also well in progress. The construction of the workshop structures in prefabricated reinforced concrete (a technique which is being tried out for the first time in this sector) will be taken in hand shortly. For this Unit 200 additional quarters have been planned out of which 80 units have been completed, 72 more are under construction and the balance are proposed to be taken up for construction during this year. On the mechanical side, pre-planning work such as preparation of shop layouts and other details have been finalised and procurement of machinery and plant is being arranged. It is expected that early in Third Five Year Plan, this permanent furnishing unit will go into production.

In the meanwhile furnishing of shells on a small scale has been commenced by providing tem-



At the launching ceremony of the 1000th Coach, the Governor of Madras, Shri Bisnuram Medhi addressed ICF workers as "Makers of Modern India".

porary facilities. Starting from May, 1957, this temporary furnishing unit has gradually developed its output capacity and is furnishing now about 22 coaches per month. It has furnished so far, nearly 500 coaches i. e. about 50% of those turned out by



While launching the 1000th Coach from ICF in January, 1960 Deputy Minister for Railways Shri S. V. Ramaswamy remarked "To us, in India, this factory is a matter of pride and to the foreigners who come from abroad, it is a star attraction".

the Shell Unit. The furnishing cost has come down from Rs. 97 thousands to Rs. 60 thousands and man hours from initial 12,900 to 5,900 per coach.

THE PRODUCT

Manning of the Factory was taken due care of from the very early stage of the project and by now, there are about 7,000 men at work in both Units of the Factory. After successfully assimilating the technical 'know-how' from our Swiss Collaborators, the skill of our Workers in the manufacture of these Integral Coaches, is now second to none.

The Factory has contributed to a very great extent to the growth of several small and medium industries in India. Purchase of materials worth about 7 crores of rupees is involved in the annual production of 700 fully furnished coaches. 16,000 tons of steel have to be processed through the different manufacturing shops. Apart from raw materials, the coach manufacture involves use of other finished and semi-finished components like steel castings, springs, aluminium extrusions, Aluminium castings, Rubber Profiles, Fastenings, interior fittings etc. When this Factory started about 159 items excluding steel were imported for Shell Unit costing about Rs. 17,600 per

CLEANLINESS LEADS TO HEALTH AND HAPPINESS

Clean orderly habits contribute to general health and welfare and as such to happiness and prosperity; they are more important than medicines.

Cleanliness prevents disease; medicine only attempts to cure.

Cleanliness of the person, of the houses and colonies, reflects discipline in the individual and the community. Discipline is the foundation stone for progress of oneself and the country. Cleanliness is a good habit. It is also cheap.

All Railwaymen should set an example of cleanliness. This will help others and themselves.

shell coach, but now all items, except five costing about Rs. 3,500 per shell coach are imported. These are laminated springs, roller bearings and 3 types of seamless tubes. Required steel will be available progressively from the Indian Steel Plants starting from the middle of this year. It is anticipated that the requirements of seamless tubes will also be met in future from indigenous sources. The design of the bogie is being changed to eliminate the use of laminated springs. This will leave only roller bearings to be imported for sometime.

Originally the Factory was designed to produce third class (T) B. G. passenger coaches for Indian Railways but now it is producing other types of



President Voroshilov of USSR after visiting ICF in January 1960 said, "We have seen your very fine factory — it is a wonderful enterprise".

passenger coaches also in integral design, such as passenger-cum-luggage vans (TLR). The manufacture is also in hand for the light weight first class (F) coaches, and Third Class (T) sleeper coaches, turnout of which is expected to commence during this year.

Besides these B. G. Integral Coaches, the manufacturing activities of this factory have covered the following other rolling stock :

- (a) Prototype for BOX Mark II and Low sided iron ores wagons,
- (b) Bogies for refrigerated fish vans,
- (c) Bogies with improved riding qualities for high-speed Deluxe train power cars,
- (d) Bogies with improved riding comforts for air-conditioned twin car sets.

It is also proposed to design M. G. passenger coaches and Diesel Rail Cars required by Indian Railways during the Third Five Year Plan in this Factory. Integral Coach Factory has, therefore, won a unique name in India in the design and manufacture of all welded railway vehicles.

CONCLUSION

The Integral Coach Factory, an important production unit of the Indian Railways, with a capital cost of Rs. 7.35 crores has already saved to the country much valuable foreign exchange, more than its capital cost. During its last about 4½ years it has produced more than 1000 coaches and is now nearly a year ahead of its original production schedule. The factory is now producing every month about 40 coaches, modern in design, equal if not better in quality, and at a cost which is less than even half that of a similar imported coach.

About 50% of the coaches are also being furnished in Integral Coach Factory itself. Arrangements are in hand to furnish all the coaches by providing a permanent furnishing unit.

What has been achieved so far in this Public Sector Integral Coach Factory, has been the result of the closest team-work of its officers and workers, who now jointly look forward with confidence to achieving still greater results, results which contribute towards Industrial progress and prosperity of India.

RAIL STRAIGHTENER

Hero of Socialist Labour D. Matveyenko, a fitter on the Bendery railway division, Moldavian Republic, has built a machine for straightening rails, his third invention in the last few months. The other two — an electric hydraulic spike puller and an eight-ton hydraulic track lifter — have been approved by the USSR Ministry of Transport for mass production. As a result of wear and tear the rail track inevitably deforms. Straightening is an extremely laborious process, and the main tool used is a clawed crowbar. Matveyenko's gadget is simple in operation and can be transported by a single person. The necessary pressure for shifting the track is created by a hydraulic pump. Tests have shown the straightener to be highly efficient.

PAYMENT BY RESULTS

By C. G. Devaya

Deputy Chief Mechanical Engineer, Integral Coach Factory

IT is the objective of every industry to obtain the maximum output from the manufacturing capacity installed and there are certain recognised ways of achieving this. Technologically it would be possible to install speedier machines and better equipment to raise production—this, however, calls for greater expenditure and consistent with the need for economy in production there is a limit beyond which no expenditure may be incurred. On the other hand it would be possible to obtain greater productivity from the already existing installation by increasing the overall plant efficiency. Such increase in efficiency is obtained in a factory by a simultaneous dual approach—Technical and human. The technical approach aims at eliminating waste, improving the operational methods in the actual process and the incidental handling work. The human approach is to ensure that there is a proper relationship between the management and labour—the well being of the worker should be assured so that his whole-hearted co-operation is forthcoming. The industries in the public sector in particular are national enterprises demanding a sense of loyalty, enthusiasm and initiative equally from both management and workers. The worker is to be given his rightful place in the industry and made to feel that he is participating in a joint endeavour wherein the management is doing the planning by means of the organisational set-up instituted and the worker is contributing his efforts in order to give the required output. Schemes such as Joint Productivity Councils, Staff Councils, which visualise affording the sincere recognition of the workers place in industry play a great role in promoting such an outlook, but there should also be a way in which the worker is made to feel that he has a positive share in the profits to the extent to which he produces. This calls for a system of payment which introduces an element of incentive in it and whereby the take-home pay has a relation to the quantum of output by the worker, duly ensuring that the worker does not have to strain himself in any way to gain a reasonable increase in the percentage as a bonus.

In the days gone by such a system of payment usually was described as ‘piece-work’ system of payment whereby a worker was paid at a certain rate for each piece turned out by him. The piece rates

were usually fixed more on a trial and error basis from the experience in the Plant or in the neighbouring Plants and generally the methods could not be described as systematic. The modern systems of Payment by results are, however, scientific and primarily aim at perfecting the work methods by a systematic Work and Time Study and provide an incentive to ensure that for a normal effort on the part of the worker he will be able to produce sufficient number of pieces, which would enable him to earn a reasonable percentage of profits.

The most important prerequisite for the introduction of an Incentive System of payment, therefore, is the preliminary Work Study. For the product to be turned out from the Plant the Production Planning or the Industrial Engineering department makes out the process planning for each operation deciding on the materials to be used, manufacturing operations to be adopted, the jigs fixtures and tools to be employed and the speeds and feeds at which manufacturing processes are to be carried out on the machines. Such planning also caters for the most efficient handling methods to be employed and other conveniences that may be necessary to relieve the strain from the worker to the utmost possible extent. Instructions are made out in forms which are easily understood to serve as a guidance for the worker so that he does not have to spend his time racking his brain as to how best he could perform the job. It is to be ensured that the raw materials required are available in time and at the correct place—that the machinery and tools are in good condition and all the other equipment required are made available as soon as the job is required to be commenced. The waiting time that usually occurs between operations in a manufacturing plant for handling by means of cranes etc., are eliminated by careful planning of the sequence of operations. All these aspects are carefully examined during the Work Study and the actual process is split up as a Work-Cycle consisting of elements each of which can be positively defined and timed. By building up the elemental timings the actual time required for the effective work is fixed. It is obvious that in going through a day's work apart from this actual time required for the work itself there are other items of indirect nature and incidental delays that occur, which have no direct bearing on the work and for

which time is required to be provided for the worker. Allowances are, therefore, established for each such indirect factor taking into consideration the conditions of working in the particular plant. Such allowances may generally be grouped as allowances for—

- (a) General handling and contingencies.
- (b) Personal allowance required by the worker for taking tea during working hours, going to the toilet, receiving instructions from the Supervisors, etc.
- (c) Allowance for fatigue—it is natural that a worker has to pause after he has done certain amount of continual manual working so that he may again recuperate his energy. The extent to which he should be given time for recovering from the fatigue depends on various factors, such as the position in which he has to work, the temperature conditions in the shop in which he is working, the lighting conditions, the concentration required for the particular type of work and various other factors which exist in the different types of industries.
- (d) Special allowances for items of work which cannot be definitely fixed for each cycle of work such as Tool Grinding, measuring, gauging etc.

The time required for the actual work together with the above allowances is usually termed as the Standard Time. To this is added the profit element generally ranging around 30% in order to inflate the time to a certain extent so that it may enable the worker to earn a bonus by putting in just a normal effort. The fundamentals of any Incentive System is to ensure that an average worker with a normal rating can earn at least about 25% to 30% more than his basic rate under normal working conditions.

The Indian Railways have also realised that for this great industry to function in an efficient manner a sound human relationship between Management and workers is absolutely essential and the necessary incentives should also be provided to the workers. This is a national enterprise of which the worker is a working partner and without his whole-hearted co-operation the desired efficiency cannot be achieved. The desired relationship between management and workers has to be achieved by ensuring that justice is

meted out to him in day-to-day working in such matters as seniority and promotions apart from providing various welfare measures in respect of which the Railways are second to none. Of special significance to the individual worker is naturally the monetary benefits that he obtains at the end of each month for the special effort put in by him for this enables him to ensure reasonably good standards of living for himself and his family. Following the examples of major industries all over the Railways have also decided that in all their factories and workshops within the next few years the workers should be brought on to the Incentive System of payment. The first experiment in the introduction of a recognised modern method of payment based on results was carried out in the Locomotive Manufacturing Factory at Chittaranjan. The experience has shown that this experiment is a success and the system of payment introduced there has provided necessary incentive for the workers enabling them to indulge in greater earnings and at the same time producing larger number of locomotives for the Railways. The locomotives were being imported from abroad previously and these can now be produced at competitive prices in the country. It has been accepted that similar system of payment in the other workshops of the Railways will produce equally good results, firstly in perfecting the methods of working, secondly in reducing the cost of production or repairs and thirdly by contributing at the same time to greater earnings to the workers. Therefore, Production Planning and Time Study organisations have been set up on the various Railways to introduce similar systems of payment in their workshops. After Chittaranjan the next factory to go into such a system of payment is the Integral Coach Factory. Having been started as a new industry the prospects of introducing the Incentive System of payment in due course has always been kept in mind. The machinery layout, the tooling, the handling methods and the process planning have all been done bearing in mind the need for introduction of the Incentive System in later years. A separate Time Study section has been in operation for the last one year and norms have been established for the various operations and times have been built up on the basis of the standard data system. A schedule has been drawn up for introducing the incentive system of payment in gradual stages commencing from the Machine Shop, where the system was introduced on 2—1—1960. There are bound to be initial snags in the beginning as in the case of all major changes generally, but it is hoped that all these will be cleared before we proceed

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Role of the Integral Coach Factory in the Development of Industries

By R. K. Tandon

Deputy Controller of Stores, Integral Coach Factory

THE various major industries and projects in the country which have developed after the Independence have contributed to a very great extent to the growth of the small industries, and Integral Coach Factory, Perambur, is one of them.

No major industry can function economically by meeting all its requirements from its own factories. Apart from raw materials it has to depend for so many items in semi-finished or finished conditions, and items like fastenings, lubricants, electrical accessories, spares for machine tools, hand tools, abrasives etc. which have necessarily to be obtained from ancillary industries. Therefore the establishment of any major or medium sized industry gives an impetus to the development of so many other industries, small and big.

Any industry when first established has to face the most difficult problem of establishing sources of supplies for the various materials required from raw, semi-finished or finished condition. This is particularly so in our country where the Engineering industries are at infancy. The development of the various industries in the country, major, medium or minor, are complementary to one another. As already stated above, it is the development of the major industries that will help the growth of the medium or minor industries.

Not only the growth of the various major industries help other industries for their development because of their requirements of various materials for processing in these major industries but also because of the large employment that is afforded, the standard of living of the people is raised, thereby increasing the demand for consumer goods. The fast development

of the medium and minor industries at present in the country is the result of the various big factories, industries and projects coming up one after another.

When the Integral Coach Factory was established and went into production in the year 1952, it had also to face the very difficult task of obtaining various items of raw materials including steel, coach components, rubber profiles, fastenings, etc. from the sources in the country. In the beginning, therefore, almost all items had to be imported and steps were simultaneously taken to locate sources of supply in the country and prospective manufacturers were approached. The problems were intimately discussed with the various producers, educational orders were issued from time to time and a stage has now been reached when it can be said that almost all items except steel, roller bearings and seamless tubes that go into the production of integral coaches are produced in the country. Steel will also be available progressively starting from the middle of 1960 till the end of 1961, when it is hoped that the full requirement of the Integral Coach Factory will be met indigenously. M/S. India Tube Co. have also gone into production for seamless tubes and it is anticipated that the requirements of these items for the integral coach will also be met in future by this source. As regards Roller bearings, there are not bright prospects in the immediate future of any indigenous source developing capacity.

In the beginning when the Factory was started, about 159 items excluding steel were imported, costing about Rs. 17,600 per coach. Now only 5 items costing about Rs. 3,500 per coach are being imported. This shows the rapid progress that was made in locating the indigenous sources of supplies which was

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further on this scheme. With the greater understanding which the workers are bound to develop after gaining experience with this scheme, it is hoped that commensurate results will be obtained. The coaches are already being produced at costs very much below the imported costs. As a result of the introduction of

the incentive system an increase in efficiency to the extent of 20 to 25% is anticipated. The wage bill will no doubt be higher to this extent but the resulting increase in outturn will reduce the overhead percentages and this should result in a further reduction in the cost of the coaches.

not only mere going about and finding out the possible sources, but an uphill task educating the various industries to come up to the required standard.

With a view to give an idea, the following summary giving the steps taken for the various items will be of interest. The various items can be divided into the following groups :—

- (a) Steel castings
- (b) Springs
- (c) Aluminium extrusions
- (d) Rubber profiles
- (e) Aluminium castings
- (f) Fastenings
- (g) Other smaller fittings for the interior of the coaches.

(A) STEEL CASTINGS

At the time of Partition there were very few Steel Foundries in the country which were just able to meet the demands of ordinary castings. Since then not only the demand has gone up considerably but the industry has been called upon to produce better castings. As far as the demand of the Integral Coach Factory is concerned, there are only three items of steel castings of which adequate capacity has been developed for two, leaving one, namely, Axle Box Housing. It is hoped that the various Steel Foundries will be able to achieve the manufacturing technique of this intricate casting and soon be able to meet the demand of the Factory in adequate quantities. For developing the sources of supply for these items the Integral Coach Factory had to approach the various Foundries individually and in close collaboration with them the manufacturing technique has been developed.

(B) SPRINGS

There are two types of springs, namely, helical and laminated. Even though the various spring manufacturing units have produced the helical springs, difficulty was experienced by them to produce bigger sizes of springs within the specified tolerances. The integral coaches are fitted with springs to very rigid tolerances to ensure better riding quality. Here again,

it may be said to satisfaction that a couple of the major spring producing firms have now been able to achieve the manufacturing technique and we may expect that the future supplies will be made satisfactorily and no import may be necessary. As regards the laminated springs, the main difficulty is the non-availability of the raw material. Moreover, the future design of the bogies is being changed to eliminate the use of the laminated bearing springs. Therefore, no efforts have been made to develop the manufacturing capacity for this item.

(C) ALUMINIUM EXTRUSIONS

As already stated, a number of fittings made of aluminium are being used in the integral coaches. These fittings are manufactured in the Factory with the raw material purchased. There was not much demand for aluminium extrusions in the country and great difficulty was felt by the only plant of M/S. Indian Aluminium Co. to meet the requirements of the Integral Coach Factory. This firm has, however, steadily increased production and in close collaboration between the Engineers of the two concerns the growing requirement is being satisfactorily met. There is good scope for other enterprisers to come in the field and start the manufacture of aluminium extrusions, the demand for which will go on rising. The value of the annual requirement of this item will be in the order of Rs. 24 lakhs.

(D) RUBBER PROFILES

There were several industries producing the rubber products when the Integral Coach Factory went into the market for their various items of rubber profiles. But great difficulty was experienced to obtain the requisite quality in the beginning. With sustained effort, the various manufacturers slowly came up to the required standard and it can now be said that these industries are satisfactorily supplying the annual requirements of the Integral Coach Factory for rubber profiles costing Rs. 5.5 lakhs.

(E) ALUMINIUM CASTINGS

There are mainly three items of aluminium alloy castings of intricate design, requiring the adoption of die casting technique and the various industries found it extremely difficult in the beginning to come up to the required standard. Even now only two or three have developed the manufacturing technique and there is scope for others to come into the field. The annual requirement for these items costs Rs. 3.6 lakhs.

(F) FASTENINGS

The original design required several items of fastenings produced from stainless steel. With a view to help the indigenous industries, the specifications were revised and fastenings produced from bright steel bars have been accepted. The industries felt difficulties in meeting the requirements adequately for want of the raw material. As soon as the bright bars are produced in the country, the difficulty will be overcome. It is anticipated that some of the industries will start the production of the bright steel bars by the end of this year. In the meantime, various manufacturers of bolts, nuts and screws have to use the imported raw material. When the raw material is available indigenously, there will be scope for others also to undertake the manufacture.

(G) OTHER SMALLER FITTINGS FOR THE INTERIOR OF THE COACHES

The various industries had already experience behind to produce the different fittings that go to furnish rail coaches. However, the new designs of the various items like seat frames, chair frames,

lavatory door locks, flushing valves, roof water tanks, etc. put a great strain on their ingenuity to come up and meet the challenge and produce materials strictly to specifications. All these fittings require more rigid tolerances and better materials too. Difficulty was felt by the industries to come to the required standard in the beginning. The collaboration of the industries with the Integral Coach Factory has enabled the production of these items in the country itself not only to the required standard but in sufficient quantity to meet the requirements of this Factory. Still, in many items, the production is just sufficient to meet the present demand which is to the extent of about 500 coach requirements a year. This demand will increase to about 700 coach requirements by the end of the Second Five Year Plan which throws very great scope for the various industries to develop themselves further and meet the growing demands as and when they arise.

The above efforts not only established the indigenous sources of supplies but also enabled the reduction in the cost of materials used for the manufacture of coaches by about ten percent. It is expected that as the industries get into the stride the cost may come down further.

NEW RAILWAY LINES

The Deputy Minister of Railways, Shri S. V. Ramaswamy, said in a written reply to a question by Shri Ram Krishan Gupta and Shri Yajnik in the Lok Sabha on December 21, 1959 that the work regarding the final location survey of the Himmatnagar—Udaipur railway line had not construction work on items like formation bridge foundations etc. would start after the final location survey was completed and the required land became available.

In a written reply to a question by Shrimati Mafida Ahmed, the Deputy Minister said that the survey of Amjanga-Dudhnai-Darangiri railway line had not yet commenced. The Deputy Minister said that the terrain was extremely difficult and there was also shortage of trained personnel who could take up work in such difficult terrain. He added that some time was therefore, necessary to collect personnel and equipment, which would be completed as early as possible and field work commenced.

Replying to another question by the same member, the Deputy Minister said that the contract for construction of superstructure of the Brahmaputra Bridge had been settled. The work of manufacture,

supply, erection and maintenance for one year of ten main spans of 397 ft. and 2 shore spans of 104 ft. 9 inches had been entrusted to the Indian Combine M/S. Braithwaite, Burn & Jessops Construction Co. Ltd. Calcutta.

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EXTRA LOW VOLTAGE TRANSFORMERS

The Indian Standard Specification for Extra Low Voltage Transformers (IS: 1416—1959) published by ISI applies to single-phase transformers rated at less than one kilovolt-ampere having separate input and output windings for connections to extra low voltage circuits. The input voltage to the transformer shall not exceed 250 volts and output voltage shall not exceed 25 volts. It covers transformers used for both outdoor and indoor purposes.

This standard does not cover transformers used in mines or of special types like flameproof transformers, or transformers normally required for use with electronic equipment, or those in which voltage across any two points in the transformers, in normal use, exceeds 250 volts.

The Indian Railways and Dieselization

By M. M. Suri

Dy. Director (Diesels)

'Why should the Indian Railways consider dieselization when coal is plentiful whereas oil has to be imported?' This question is asked very often. For an answer, an overall assessment has to be made of the future requirements in the context of the increasing strain upon the country's resources. The difficulties arising from steam traction, future procurement and movement of coal over the Indian Railways, the national wastage of indigenous fuel resources in burning coal through the chimney of a locomotive, etc., have all to be considered. The magnitude of the problem, especially concerning diesel oil, has to be reduced to correct dimension. An integrated picture has at first to be drawn of the broad aspects of dieselization. At present, India is amongst the very very few countries of the world left with steam traction. All others have electrified/dieselised completely — or are in the process of doing so. It is hoped that the following pages will answer a large number of questions while focussing attention upon the need for immediate though limited dieselisation of the Indian Railways—AUTHOR

THE greatest burden of all 'Five-Year' Plans falls foremost on the Indian Railways. In a vast subcontinent with long distances between far flung areas, no other mode of transportation overland could be as economical as loads hauled over steel rails. The increase in Railway transportation capacity has essentially to precede the increase in production and trade in the country. If the Indian Railways fail to meet the requirements of India's new born industry, and are unable to move the required quantities of raw materials, or finished goods, the 'Five-Year' Plans shall suffer a considerable set back. The Railways have a major contribution to make in the entire development and prosperity of our country. Easy, quick and cheap movement of merchandise, food, raw materials etc. controls the entire price structure of all commodities, which in turn affects the wage structure within the country and cost of finished products. The need for an efficiently run railway system is paramount.

For years to come, essential raw materials will have to be continued to be imported into the country. The prosperity of our country depends only upon building up a sizeable export. Here again, the Indian Railways have a major contribution to make. World markets are highly competitive. Before a finished product is exported, the raw materials, partly finished materials, components, and the finished articles might have registered long movements and cross-movements over the length and breadth of our sub-continent. The importance of the Railway freight structure in a country of the size of India, cannot be over emphasised. India's export merchandise must be cheaply and quickly carried to destinations. The overall efficiency and economic running of the Indian Railways is a prerequisite to the country's future prosperity.

The Indian Railway system, 100%, State owned is also the country's single largest industry. Within its organisation it holds the largest single investment of the country's funds (1200 crores approx.). If this amount of Public money earns no profit, it shall become the largest single liability of the Nation! It is essential for an investment of these proportions to yield a profit and to continuously enrich the Public Funds.

The cost of fuel consumed represents approximately 18% of the total working expenses of the Indian Railways. No other single item of expenditure costs half as much. The importance of fuel-cost-consciousness is self-evident. And this fuel is consumed by the motive power unit, i. e. the locomotive. The choice and the efficiency of the type of power unit selected for traction is therefore of far greater importance than is generally realised by the public, or even by most Railwaymen themselves!

There are at present three basic types of power units, the electrical, the diesel, and the steam. The electrical, because of its requirements of stationery installations involving large capital expenditure for distribution of power, affords an economical solution only over those sections of the Railway that have reached a certain minimum traffic density. Electric traction has to its credit the prospects of abundant and cheap supply of electricity fed through a country-wide net work of hydro-electric and thermo-electric power stations. In the future the nation-wide grid can even be fed from thermo-nuclear power stations when they are set up. Based on these considerations, and until oil is indigenously available, it could safely be said that electric traction would be the correct choice for traction over the Broad Gauge trunk routes, where

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traffic density will most likely justify it, i. e. Calcutta-Bombay, Bombay-Madras, Madras-Calcutta, Madras-Delhi, Delhi-Bombay, Calcutta-Amritsar, Allahabad-Bombay. It is estimated that approximately 50% of the future loads could flow across these electrified sections of the Indian Railways with advantage.

The electrification plans under consideration of the Indian Railways are the largest ever to have been undertaken by any Railway of the world. With all the resources mobilised to the fullest, it is estimated that electrification to the extent outlined above, even if accepted, could be completed only with the greatest of difficulty, in about 15 years time. The choice of the motive power over the rest of the Indian Railways would still remain to be studied.

There is no doubt that advancements made in diesel locomotion in the post-war period have almost pushed steam traction off the rails in most countries of the world. The great versatility of diesel units as vehicles of transportation, fully self-contained, their operating economics, reliability in service under varying conditions etc. have earned them the venerable place they hold all over the world as traction units. In India today, based purely on operating economics or operating requirements, a case could be made out in favour of diesel traction over large tracts of the sub-continent that are not planned for electrification.

Irrespective of all other considerations of immediate or future economies in expenditure, which doubtless assume an ever increasing importance as the Railway budgets swell through Plan after Plan, there has been the consideration that diesel oil is an imported fuel. But it is to be ascertained how far we can afford to continue running our Railways uneconomically with Steam despite modern developments. It is of vital interest to the Nation that the Railways run at minimum cost and maximum efficiency, otherwise the export trade and foreign exchange earnings will be seriously affected. To this extent the decision to import oil for limited dieselization, like import of other essential raw materials for some key industries, may be not only justifiable but inescapable. A further essential to be noted is the quantum involved. The requirements of the Indian Railways shall total upto a mere 4% of the country's demands by 1970 in respect of oil. If the remaining 96% of oil is accepted as essential to the developing economy and prosperity of India, the 4% required on Indian Railways for exactly parallel reasons should arouse no undue comments!

Steam traction in India has to its credit the use of indigenous fuels, the availability of technically trained personnel, complete technical know-how and the achievement of high standards of reliability in service. However, it cannot be denied that the power weight ratio is poor. Much larger tonnages of steel and other essential raw materials yield steam units of far less aggregate power. The ratio of engine weight to train weight is high which wastes fuel on self propulsion. A steam engine is an inefficient consumer of fuel. Where it consumes 10-12 wagons full of coal, a diesel locomotive could do with only one wagon of oil. If steam traction alone is adhered to, by the end of the IV Plan the Railways will choke up their already heavy worked sections with the haulage of approximately 35 million tons of departmental coal against the present haulage of about 14 million tons. A very large number of wagons carrying Railway coal will be lost to the commercial department representing a sizeable loss in Railway earnings, if alternative fuels are not utilized by the Railway.

As mentioned above, most of the trunk routes on the Broad Gauge could profitably be electrified. Steam units released by this electrification could augment the numbers existing on the rest of the Broad Gauge and cope with expanding needs there. It is more urgently on the Metre and Narrow Gauges that a choice will have to be made in the immediate future when purchasing new stock. On these smaller gauges the steam engine suffers great disabilities due to the severe restrictions placed on its design by limitations of the loading gauge requirements. The size and numbers of steam engines required, the increase in shed facilities required with these not-too-compact power units, reaching coal to all the coaling points etc. will pose problems that shall force the Mechanical, Operating and Transportation departments to search for an answer afresh, at least in some of the regions, in order to run the Railways at reasonable cost, or cope with the increased transportation demands.

A further consideration in regard to steam traction is the fact that demand on coal is increasing at a very rapid pace all over the country. The present production is around 48 million tons whereas by 1965-66 the requirements are estimated at 100 million tons. The coal mining industry is greatly strained to meet this rapidly increasing demand, and has to be offered some relief from the Railways where alternative fuels can be employed. In any case the Railways are being forced to give up the use of metallurgical coals, and accept instead, inferior coals

for locomotives because India's resources of metallurgical coals are limited. Burning inferior coals in locomotives will reduce the hauling capacity of the present-day steam locomotives, increase the coal consumption per thousand gross-ton-miles hauled, and result in still more expensive locomotion. This subject has received very comprehensive treatment in 1958 in the Report of the Expert Committee on Coal Consumption on Railways. The committee has recommended electrification and dieselization as the means to overcome shortages in supply of requisite quantity and quality of coal to Railways in the near future.

The problem of diesel versus steam involves one more question. How far should the fear of a likely war force us to continue running our Railways uneconomically with steam? If peace does continue in spite of cold wars or if oil supplies continue despite a war, we would discover at the end of 20 years from now that we had erred beyond all considerations of basic railroad-economics, and crippled the pace of technological advancement in Railway operation in our country, if today we were to shelve dieselization of areas where substantial economies can be achieved.

For an objective appraisal of this problem we should first gauge the extent of dieselization essential to our needs, and assess the real magnitude of the problem before dieselization as such, is rejected, or accepted.

If dieselization is not launched upon as a fad, if steam traction is allowed to continue to pay dividends where it can until the time the problem of oil is fully solved, the following limited extent of dieselization could prove advantageous.

(i) Shunting over a large part of the Indian Railways.

(ii) The entire North-east Frontier Railway—continuing with steam traction in this region results in a double waste of national resources. Oil is exported from this region and coal is imported at considerable cost of haulage, transshipments etc. The limitations of adhesion in the case of steam locomotives are also beginning to tell upon the section capacities in this region. Dieselization could result in large economy in expenditure on fuel besides speeding up all goods traffic and improving section capacities.

(iii) Saurashtra region—where bad water is a perpetual source of trouble for steam engines; where coal has to be hauled across thousands of miles and then transhipped, while oil is available at the ports requiring none or little haulage. Here again, dieselisation will pay large dividends. Saurashtra's industries are becoming more and more live. The expansion of the Railway organization is imminent. Any expenditure now incurred on steam traction will only prove infructuous when dieselization is at last accepted.

(iv) Southern India—where coal prices are extremely disfavoured to steam traction.

(v) All hill railways, Kalka-Simla, Kangra Valley, Darjeeling-Himalayan, Matheran Light Railways, etc., that are uneconomical propositions when run with steam traction, can be made to run at lower costs and may even become profit earning sections when dieselized.

(vi) Railcars are proving themselves all over the world as most economical units of transport over selected areas of operation. In India, many such areas exist.

Even if dieselization is undertaken to the very limited extent outlined above, it would take us to the end of 1970. The total oil requirements on the Railways by then would not exceed one million tons. This would represent approx. 4% of India's estimated oil consumption in 1970. It is then to be argued, if the country as a whole could face the risk of war or otherwise justify, consumption of the rest of the 96% of oil, the Railways could surely plan to profit with limited dieselization using only 4% of the country's total consumption. However, this is not the only reason for facing the risk of war with a certain composure.

The National Physical Laboratories in India have carried out a great deal of applied research in recent years using vegetable oils of indigenous produce, both as fuels as well as lubricants for diesel engines. The experiments have recorded a great measure of success. India exported about 10 million tons of vegetable oils last year. In the event of a war when no mineral oils flow in, the vegetable oils will cease to flow out. They can more than provide cover against the 'risk of war'.

The proposed amount of dieselization would replace 10-12 million tons of consumption of inferior coal by one million tons of oil. Complete gassification of coal and its synthesis to yield oil is as yet an expensive process. But the 10-12 million tons of inferior coal released by the Railways could be turned into domestic coke (approx. 9-10 million tons). This would meet the great shortage in this country of domestic coke. (It is estimated that by 1965, a total of 10 million tons of domestic coke will be required annually). This low temperature process of coking will yield approximately one million tons of tar from which upto 0.8 million tons of diesel fuel could be derived by hydrogenation at competitive prices. This process also yields many chemical by-products of considerable value. Thus the same quantity of coal now burnt through the chimney of a steam locomotive, could provide the much needed domestic fuel, large quantities of chemicals and at the same time provide oil to run the trains that the original quantity of coal would have run with a steam locomotive.!

The practicability of running diesel locomotives with coal gas produced on a tender carrying coal, has already been demonstrated in Russia and elsewhere. If the Railways were to institute research for running diesel locomotives with coal gas we could face any and every threat of war or oil shortage with confidence. The technical problems involved in this have largely been solved. Further applied research is required merely to perfect the apparatus for more economic operation.

Based on the above considerations the pattern of transportation on the Indian Railways around the year 1970 could with advantage be, 50% electric traction, 30% steam and 20% diesels. It is important to note that 30% steam traction at that time will entail a consumption of 18-20 million tons of coal against the present day consumption of 13-14 million tons of coal on the Indian Railways.

A little known fact is the great advancements being made by Indian Railways in the field of Diesel Locomotive Engineering which are already beginning to receive world acclaim. As soon as Indian industry is geared up for production of diesel locomotives it shall find a vast potential for export to the entire region of the Far East where all countries barring none have decided to dieselize their railway systems in entirety. Indigenous industry, both for economic production of exportable locomotive, as well as technological advancements in diesel locomotive engineering depends upon the policy of the Indian Railways who alone can provide the Industry a production base load and feed it with scientific data for future advancements.

All these considerations would lead to the conclusion that the Indian Railways could afford, in the best present and future interests of the country, to embark upon a policy of immediate, though limited, dieselization of the Indian Railways.

(Courtesy: IRE Bombay)

New U. K. Marshalling Yard is most Modern in Europe

EXTENSIVE USE OF AUTOMATIC EQUIPMENT

A new £ 2,500,000 marshalling yard at Margam, Wales, with extensive automatic equipment, has just been opened by British Railways. Covering 170 acres and comprising 33 miles of running lines and sidings, it has taken more than two years to build.

It is claimed by Sir Brian Robertson, chairman of the British Transport Commission, to be the most modern railway marshalling yard in Europe. It is a two-way yard, capable of dealing with 4,500 wagons daily and with 220 trains in and out each day.

Latest electronic techniques, including radar and

computers, are used. Operations are directed from a control tower manned by two panel operators.

The new Margam yard has 12 reception sidings, 48 sorting sidings, and 10 storage sidings. Points are automatically set by a coded tape and the amount of braking to be applied by the fixed retarders is worked out by a computer. Among other modern aids are two-way radio telephone, one-way portable radio transmitters, two-way loudspeakers, teleprinters, and a 60-line automatic telephone exchange.

The yard has been designed in close co-operation with the Steel Co. of Wales to cater for the firm's requirements.

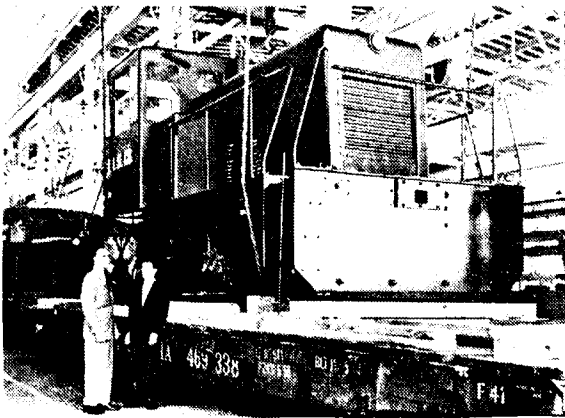
New Locomotives for TISCO

India's fast growing steel industry will gain more "muscle" this year in the form of ten new diesel-electric industrial locomotives.

The order for the locomotives by Indian Iron and Steel Company was announced recently by officials of General Electric's (U. S. A.) Locomotive & Car Equipment Department which will build the units in its Erie, Pennsylvania, plant.

Estimated cost of the order is in excess of \$ 750,000, according to G.E. The new locomotives will be used by TISCO to haul raw materials to its mills and to transport finished steel products to railheads for shipment to warehouses and to users.

Four of the new locomotives will develop 550 horsepower and the six remaining locomotives will each develop 275 horsepower.



This present order will bring the total number of General Electric industrial locomotives serving India's steel industry to 87, with 27 of these in service with Indian Iron and Steel.

Incidentally, halfway around the world from Indian Iron and Steel's mills in Burnpur, other G—E industrial locomotives are supplying vital motive power for Argentina's big new steel mill in San Nicolas. There, approximately 200 kilometers north of Buenos Aires, 420-horsepower G—E diesel-electrics are being used to haul raw materials to the mill.

* * * * *

SMALL TRAIN MAKES HISTORIC TRIP

A big diesel-electric railroad locomotive hauled a

small two-car train on an epic making trip recently. The locomotive was the thousandth diesel-electric unit built by the General Electric Company (U. S. A.) for use by a South American railroad and it was making a special inaugural run for the benefit of railway and government officials and members of the press who jammed the two cars it was hauling.

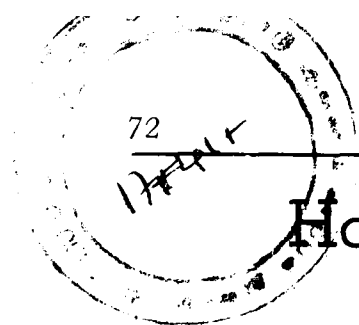
The train consisted of the locomotive, a pullman car and diner. Departure point was the Buenos Aires terminal of the General Manuel Belgrano Railroad. The end of the ride was at the town of Del Viso, some 57 kilometers from the capital.



Members of the Argentine press, government and railway officials are shown in the Buenos Aires station of the General Belgrano Railway shortly before boarding a special inaugural two-car train hauled by the 1000th locomotive built for a South American railway by General Electric Company (U.S.A.). The 1320 horsepower diesel-electric unit is shown in the background.

The press, government and railway officials were invited on the inaugural trip by General Electric Argentina, S. A.

Built by the G—E Locomotive & Car Equipment Department in Erie, Pennsylvania, the 1320 gross horsepower locomotive was delivered to Argentina late last year for use by the Belgrano Railroad. It was one of fifty recently ordered by Belgrano officials. General Electric's 1000th South American locomotive is of the universal-type found on several Brazilian lines, including the Paulista, Sorocabana, Santos a Jundiai, Santa Catarina and others. Out of the 1000 locomotives shipped to South America since 1915, Brazil, with 300, has received the greatest number.



How to Reserve Accommodation

Unless you reserve your berth (I Class) or Seats (II and III Class long distance) in advance, you may not be sure of getting accommodation on the train you wish to travel by.

Application should be made to the Station Master of your starting station at least 3 days in advance specifying the date and train by which you intend travelling and the tickets must be bought in advance. The reservation fee leviable is 8 Annas per seat or berth.

Reservation by I and II Class from intermediate stations by Express trains can also be made similarly, but reservation ticket can be issued only after getting an advice from the Reservation Centre that the reservation has been made.

Tickets will be issued only if accommodation is available.

If the reserved seats or berths are not occupied at least 5 minutes before the booked departure of the train the reservation will be cancelled and the seat or berth given away to another.

Reservation fee is not refundable

III Class seats are also reservable on Express and certain other important trains for long distance passengers from the train-starting stations on payment of a reservation fee of 4 Annas per seat.

Do not occupy a berth or seat reserved for another, as you are liable to be displaced at the last moment.

If you find another person occupying the berth or seat reserved for you and if he will not vacate it on demand, report it to the Guard or Station Master. They will help you.

(Inserted in the interests of Travelling Public)



IMPORTANT ANNOUNCEMENT

We will be issuing INDIAN RAILWAYS HOSPITALS ANNUAL again in 1961 along with our April 1961 edition. We need not very much stress the popularity of this ANNUAL which has been well received by eminent Medical Practitioners in Government Hospitals, Railway Hospitals and in Private Clinics. This is the only RAILWAY HOSPITAL ANNUAL to be published on the whole of Indian Railways system every year. Hence its publicity value need not be over-emphasized.

Manufacturers of pharmaceutical and biological products are requested to reserve their advertising space in our 1961 ANNUAL as usual and communicate their decision on or before 15th April 1961.

EDITOR

PERAMBUR RAILWAY HOSPITAL—JAGJIVAN RAM OPENS NEW BLOCK

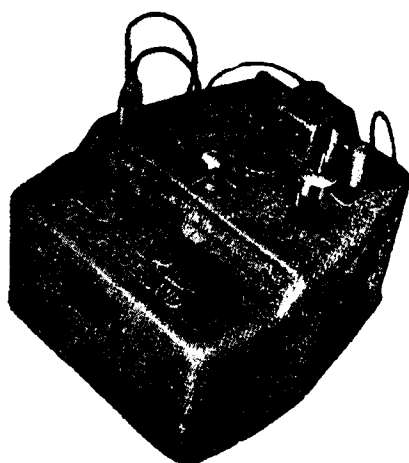
The Railway Minister Mr. Jagjivan Ram, declared open recently the new extension block to the Railway Hospital in Perambur.

In the course of his speech on the occasion, Mr. Jagjivan Ram said that the Railway Ministry had been doing its best to provide adequate medical facilities to the Railway employees. The standard of medical facilities provided by the Railways was no doubt much higher than the average standard of medical facilities available to others in the country. This was because of the peculiar nature of work on the Railways and in the Railway workshops. He thought any prudent employer should first think of the health of his workers because whatever money was spent on the health services or medical services was amply returned. There was close relationship between the health of the workers and their efficiency. If the efficiency was affected the turnover would also be affected. It was advantageous, therefore, to provide better medical facilities for the employees and their families.

A new department (known as Hand Clinic) for treating injuries sustained by workers on their hands had been started in Perambur. He appreciated the establishment of a Blood Bank there. He wanted every hospital which dealt with accident cases and conducted operations to have Blood Banks. The Minister emphasized that doctors should give priority in the nature of the disease and not the status of the patient. Earlier, Mr. A. G. Mukerji, General Manager, Southern Railway, gave an account of the growth of the Railway Hospital which was constructed in 1929 with a bed-strength of 50. In 1957 the Out-patient and Administrative Block was put up at a cost of Rs. three lakhs. During the last three years the Hospital had been undergoing gradual and steady extensions. The new Block has been constructed at a cost of rupees eight lakhs, and the total strength of beds in the hospital was 144. He said the Hand Clinic which was found only in highly industrialized countries to treat injuries and infections of the Railway workers had been started recently in Perambur.



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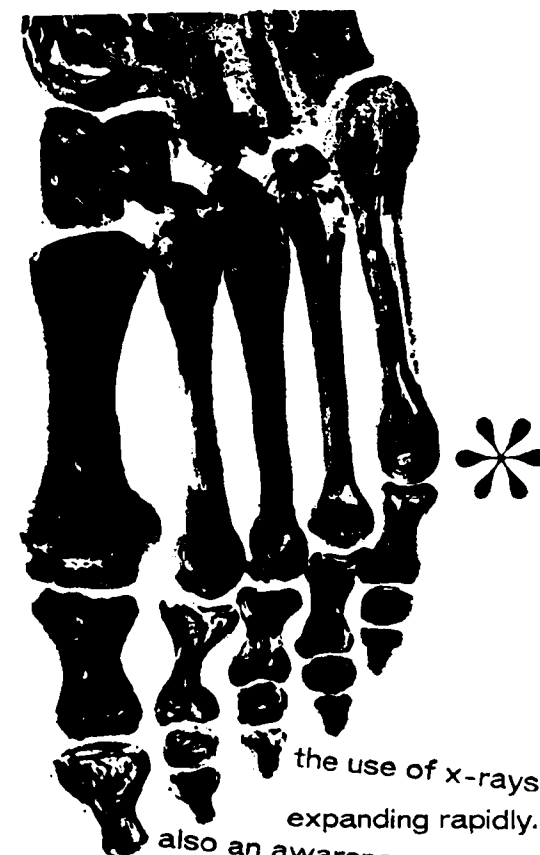
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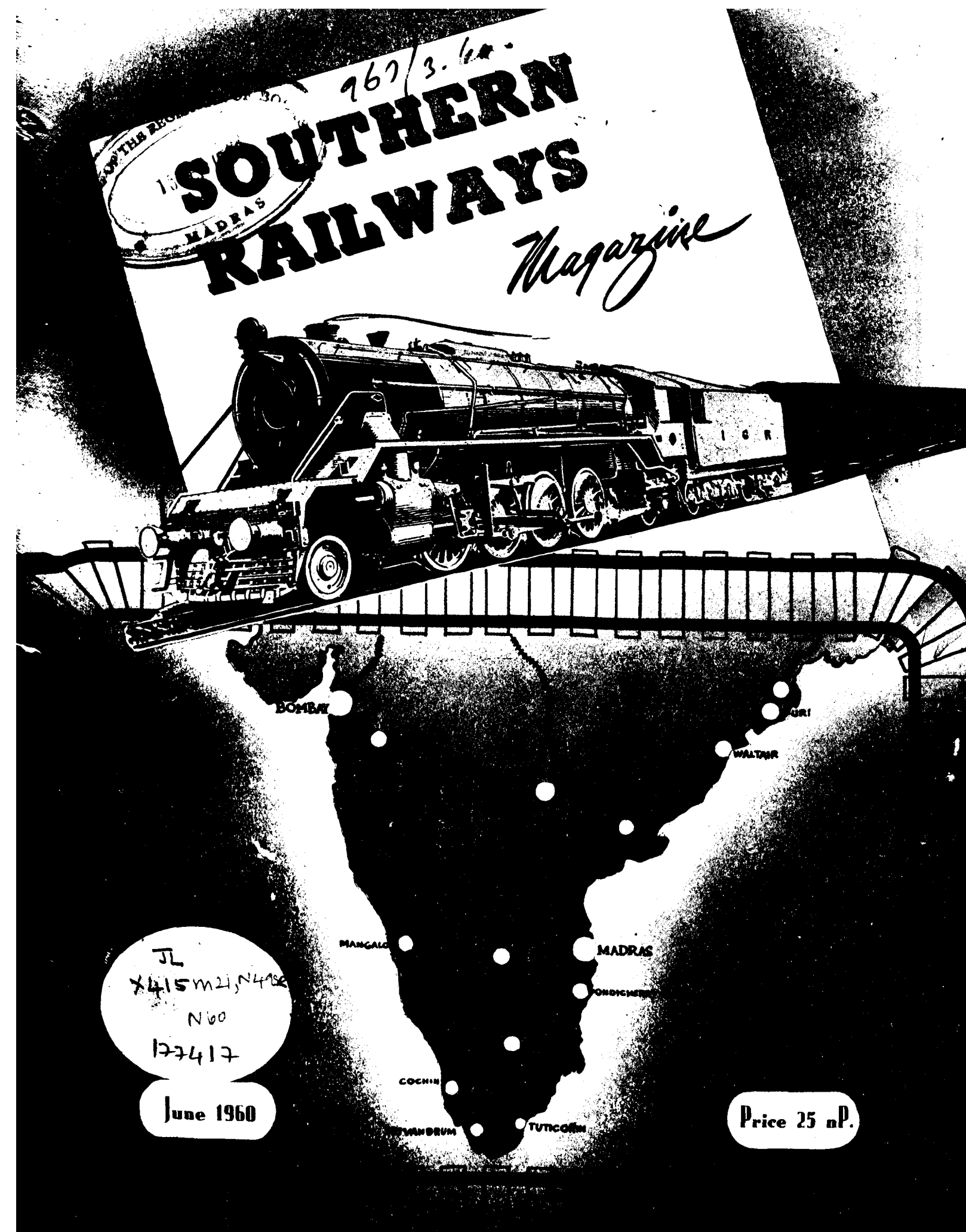
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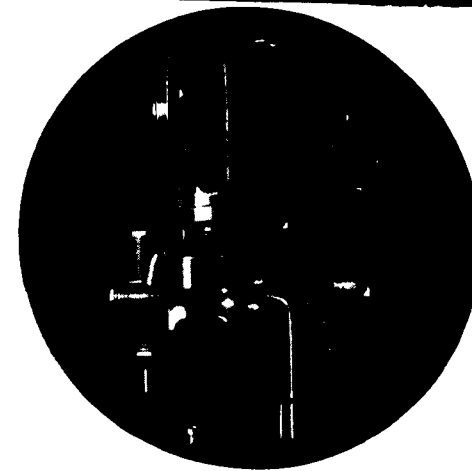
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Future Trends in Locomotive Power for the World's Railways

By F. A. Compton, Jr., Manager
Locomotive Section, Locomotive & Car Equipment Department,
General Electric Company (U.S.A.)

PREDICTING the future is always a fascinating, although quite often a somewhat risky business. This is particularly true in forecasting probable trends in railway motive power developments for the next decade.

Barring a revolutionary technological break through future development of locomotive power in all probability will be limited to (1) refinement of the diesel-electric locomotive, (2) further development of the gas turbine-electric, (3) progress in electrification and (4) application of atomic power to locomotives. Each of these is based on the electric transmission of power from the prime mover to the rail. In the experience of a vast majority of the world's railways, this system is the most efficient, the most reliable, the most easily maintained, the easiest to operate and in the long run by far the least expensive.

Obviously the direction in which motive power will progress is directly related to the operating, maintenance and financial requirements of the railways. In addition, continued economic development in areas throughout the world will also have a decided effect on railway practices. As the industrial output and the demand of the people for more and more goods increases, transportation facilities of necessity will have to become more efficient to keep pace with this stepped-up industrial production and the increased demand for consumer goods. Railways are pre-eminently fitted for such a role as no other form of transportation can approach their efficiency for the mass movement of goods.

In an expanding economy, railways will be unable to afford the luxury of working a freight car only 50 miles per day, or of taking four hours to drag up grade which could be pulled in one hour. More and more power will be needed, and only machines can supply power in the quantities which will be required.

In the light of the requirements of an expanding economy, what are the relative merits and the chances for development of each of the four types of motive power?

DIESEL-ELECTRIC LOCOMOTIVE

Considering all the factors on which a sound estimate of the future can be based, it is reasonable to assume that the diesel-electric locomotive will provide the bulk of motive power requirements for at least the next ten years, and probably for quite a bit longer. Diesel engine progress over the past fifty years has been truly significant. The first diesel engine for locomotive service in the U. S. was built by General Electric in 1918. Since it was a naturally aspirated engine and represented a real pioneering effort, it had an output of 25 horsepower per cylinder. In 1935, before turbosupercharging was perfected, a horsepower of 110 per cylinder was normal. At the present time, the type F engine in the universal line of General Electric (U. S. A) locomotives is rated 165 horsepower gross per cylinder and under test conditions engines have been run at over 200 horsepower per cylinder. All these ratings are on cylinders of nearly the same size.

With such a record of past progress there is every reason to believe that the diesel-electric locomotive will continue to improve in reliability and specific fuel consumption; that further reductions will be made in maintenance cost; and that it will have even longer life in the future. Considerable sums of money are being spent by private industry in the United States for continued research on diesel locomotive power which is indicative of the confidence we have in the future of the diesel-electric locomotive. Changes which will probably occur within the next ten years will be mostly evolutionary rather than revolutionary. They will include a continued growth in specific horsepower, elimination of maintenance points, increase in reliability, and the perfection of a better

adhesion loss detection and correction device to allow maximum use of high horsepower per axle.

In connection with maintenance, it is not improbable at all that in the far distant future a locomotive will be sealed at the factory and not require any maintenance during its entire life. Steady progress is already being made along the path of development leading toward such an ideal objective. Many positive steps already taken in this direction include the wide use of synthetic resins in impregnating coils and the complete encapsulation of some control elements. These synthetic materials utilize the good properties of natural oils and resins while eliminating those that are undesirable. Each future step will be made commercially available as soon as it has been thoroughly proved in service as well as in the laboratory. The trend is inescapable—the eventual development of a maintenance-free locomotive.

GAS TURBINE-ELECTRIC LOCOMOTIVE

Although General Electric has manufactured a total of 55 gas turbine-electric locomotives, all of these have been purchased by one railway, the Union Pacific. The reason for this lies in several unique factors which make these units well suited to operation on this particular road. In the Western United States there are large amounts of residual fuel suitable for use in the gas turbines. Even though the specific fuel consumption of the gas turbine is higher than that of a good diesel engine, the resulting overall cost is competitive. Also, Union Pacific has long hauls, with extremely high tonnages at high speed. This requires full power from the locomotive for long periods of time, the condition under which the gas turbine is at its best. It is quite common for one of the 8500 hp. locomotives to haul a 6000 ton freight train at 65 mph on the level. Although the majority of the run is quite flat, the ruling grade is 1.14% for 34 miles, and good speed must be maintained there also.

What then is the application of the gas turbine other than to Union Pacific? Where conditions are right; that is, where there is a good supply of residual fuel, where average speeds and tonnages are high, and where schedules are frequent enough to ensure high locomotive utilization, the gas turbine is a fine locomotive. But the number of railways in the world where all of these conditions exist is quite small, and we see only limited application of this type of locomotive. Twenty-five of the locomotives built for the Union Pacific are 4500 hp, which appears to be just about the lower horsepower limit. The

problems, however, are economic, not technological, and accelerated volume of freight traffic may produce a demand for gas turbine locomotives both sooner and in greater quantity than what we now anticipate.

ELECTRIC LOCOMOTIVE

The electric locomotive is another form of motive power that has been hampered by economics rather than engineering. In fact a great many engineers are firmly convinced that the electric is the greatest locomotive ever conceived. It meets all the requirements of good engineering—it is simple, it is clean, it is powerful, it is durable. But unfortunately, where there is not enough traffic, it is also uneconomical.

There are some other factors which influence electrification of railways. The inherent cleanliness of electric power and the ability of electrically-powered trains to operate underground have already forced the electrification of lines which otherwise would not have been ready for that step for quite sometime. Also, steep grades have brought electrification to some lines because of the high power necessary for proper operation of the railway and the ready availability of such power only with electrification.

Without doubt, the future trend of electrification will follow much the same pattern as in the past. It will be used wherever and whenever traffic density is high enough and the price ratio of electrical power to diesel fuel is low enough. Also, the cost of money must be low enough to permit attractive returns on the large amounts of capital required for overhead structures and substations. Relatively new developments permitting the use of commercial frequency high voltage a-c make electrification more attractive by reducing this investment.

What of the future? Without question, electrification of additional systems and expansion of existing lines will continue, probably faster than has been the case in the past. However, as is the case with the gas turbine, only in a few places do all the required elements exist, and for some time the percentage of trains hauled with electric motive power will increase rather slowly. In certain areas electrification may be justified as a means of conserving natural resources or obviating dependence on imported fuel, even though the direct economy might not warrant the investment.

ATOMIC POWERED LOCOMOTIVE

Probably no term has more attention commanding

ability these days than "atomic power". Can it, will it be applied to motive power for railway use? Undoubtedly it will; but we believe that its widest application will be for central station generation of power to be used on the railways via electric locomotives.

The problems which surround railway application of nuclear propulsion by means of a mobile power plant are far greater than any yet approached in either the railway or atomic power engineering fields. According to the most recent studies the weight of the reactor shielding alone would exceed the permissible weight per axle of the locomotive. This figure does not take into account any of the actual propulsion equipment required on the locomotives. Additionally, the danger involved in the day-to-day operation of a locomotive with a reactor on board would present extremely serious hazards to life and property.

It is evident that, at the present state of the art, an atomic locomotive which carries a reactor on board is highly unlikely. But work in progress in laboratories throughout the world may some day make the self-contained atomic locomotive a reality, particularly if a direct conversion device with the required shielding and having a high enough rating can be produced.

MOTORIZED WHEEL

Another development along a different line in the motive power field, so new that it really should be included in a discussion of the future, is the motorized wheel. A wheel which incorporates an electric motor inside the hub of rubber tire has been designed and thoroughly tested by General Electric. The motor drives directly to the rim through a single set of planetary gears, and the unit can be mounted directly on the side of a vehicle or suspended by means of any type of spring system. Power can be

drawn from a diesel-electric or gas turbine power plant, or from an overhead trolley wire or third rail.

Although this wheel was originally designed as a drive system for off-highway vehicles, several studies of rail haulage problems involving particularly severe grades indicates that a rubber-tired locomotive may be a unique and significant development. A line laid with extra long concrete ties projecting on both sides of the rails would provide a roadbed for the locomotive, and grades of 15% could be negotiated satisfactorily while hauling conventional freight cars. The rubber-tired locomotive is not intended as a replacement for the conventional type, but would be used for specific, difficult applications.

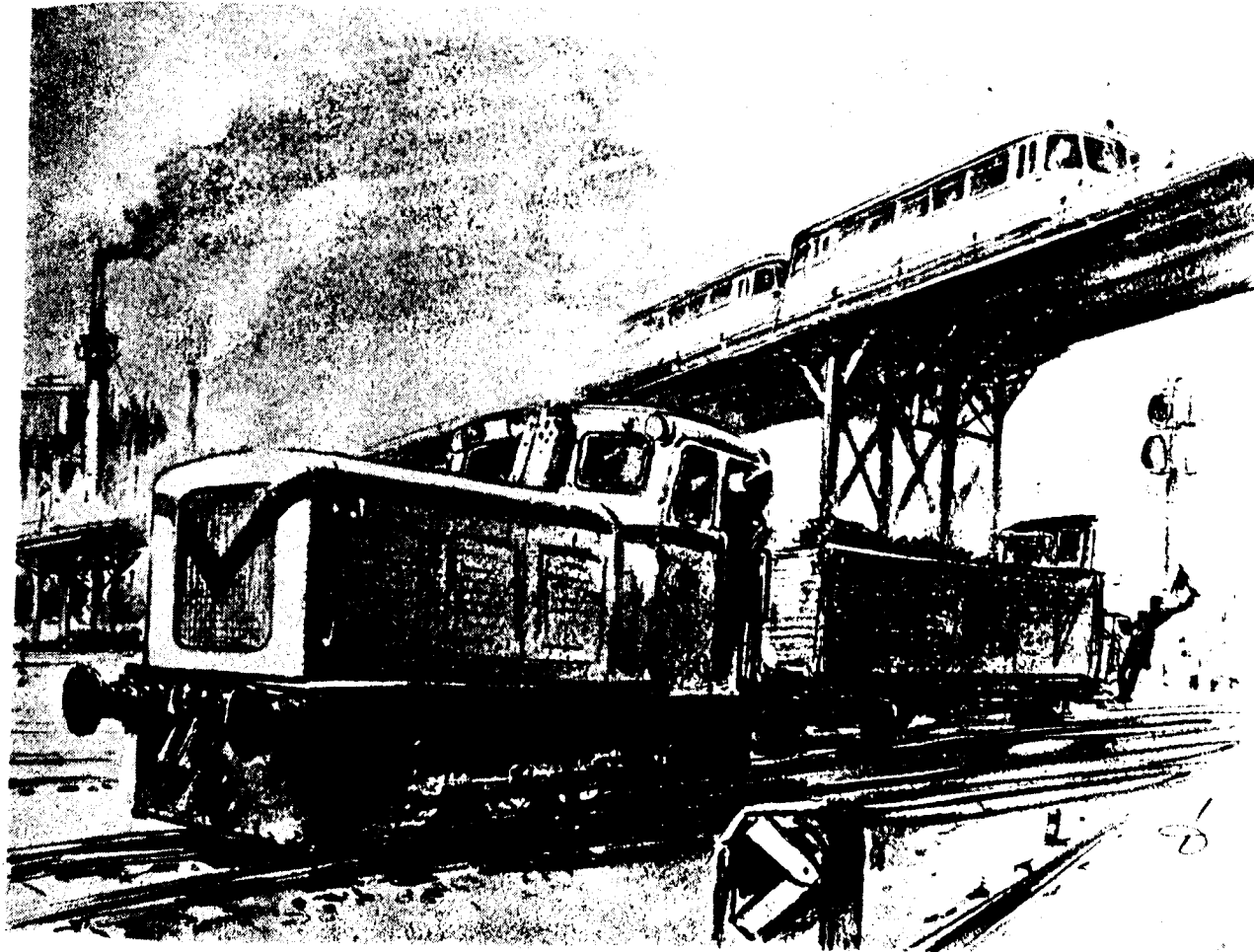
SUMMARY

In summary, for the next ten years at least, the diesel-electric locomotive will continue to occupy the major place in the motive power of the world's railways. Electric locomotives will become increasingly important as traffic density increases or other compelling factors enter the picture. Gas turbine-electric locomotives will fill a special need for some railways, and atomic power will be used in stationary electric generating plants to supply energy for railway electrification. Great strides will be made in reduction of maintenance, and simplification of components. Whatever the form of motive power, standardization on a single locomotive type for entire railway systems will become virtually universal.

All this progress in the development of motive power is aimed at producing railway progress—using electric power and machines to lift the load from the backs of human beings. The more this is done the more sound will be the economic progress of the railways, and a sound railway system is the keystone of a solid national economy.

Indian Standards Presented

To assist in the promotion of standardization movement in Iran, the Indian Standards Institution presented on 31st May, a complete set of its publications consisting of some 1400 Indian Standard Specifications, copies of its Journal ISI Bulletin, Handbook of Publications, etc. published by it during its thirteen years of existence, to Edardh Standards-ha, the National Standards Department of Iran which was established about 3 years ago. Mr. H. Hakimi, the First Secretary in the Iranian Embassy in New Delhi, received at Manak Bhavan, the Headquarters of ISI, the gift on behalf of his country's Standards Department from Dr. Lal C. Verman, Director, ISI.



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Special importance was attached to the best conditions for seeing, silent run, low consumption and high tractive power.

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Austrian Shunting Locomotives

600 BHP three-axle diesel-hydraulic design

INVESTIGATIONS about the suitability of a change in traction to Diesel service have proved that the state railways will have many advantages when using Diesel locomotives for shunting duties. This will reduce costs for maintenance, fuel and the operating staff. With regard to this special requirements the Jenbacher Werke A. G. have developed a locomotive of 600 BHP for heavy shunting duty and open track work with light trains. The locomotive "Jenbach DH 600 C 48" comprises the rigid frame, superstructures and driving mechanism. The particularly rigid and shock-



resistant frame is designed to take up a 300-ton impact force without any permanent deformation. Power transmission and drive are fitted to the frame which also carries the engine cowling with the cab and, at the head and tail, the buffers, couplings and adjustable fenders. The cab and control desk give the greatest possible safety in operation by extreme ease of control and optimum visibility of the line and signals. The locomotive can be driven with equal ease from each side of the control desk by one man who can be either standing or seated. Hot water heating, sound—and heat insulation, and efficient ventilation of the cab assist the driver to remain alert even over hours of duty. The engine compartment is cased-in with steel plates on all sides. The bonnet side panels can easily be removed, giving full access to all parts of the engine for servicing. The controls are installed in the cab, accessible from either

side and additional control instruments are provided to ensure that engine lubrication and cooling, and gears are functioning correctly. Automatic controls reliably prevent damage due to neglect of cooling water temperature and oil pressure. Safety switches are provided to prevent damage to the gears by careless gear changing or drag.

There are two pairs of lights at head and tail of the locomotive which can be dipped, and which can be adapted for use as parking lights by the insertion of a coloured pane. Glarefree lighting is of course provided for the cab. All instruments are illuminated even in the dark by indirect lighting. A compressed air whistle whose pitch is such as to penetrate the engine noise even in the closed cabs of other vehicles is provided for signalling. The locomotives are fitted with air brake equipment having two separate brake systems. Braking of the locomotive itself is effected by a direct-action non-automatic brake whose controls are combined with a hand screw-down brake. The trucks are usually fitted with automatic brake devices for indirect operation from the locomotive by means of a special brake valve. A piston compressor driven by V-belt drive from the engine controls the pressure of air to the brakes. Safety valves in the brake system prevent the maximum pressure in the compressed air receivers and the main brake cylinder from being exceeded. Pressure in this cylinders is so controlled that the contact pressure of all the brake shoes together does not exceed 80% of the weight of the locomotive. This means that the wheels cannot be locked unintentionally. Compressed air coolers and water separators ensure complete safety of operation of the whole brake system, which can be coupled to be brake system of the trucks by means of connecting tubes. In order to improve the braking action on wet or dirty rails a compressed air operated sanding device is provided which distributes sand evenly over the rails in front of the axles in the direction of movement. Sand concentration can be controlled by means of the operating valves in the cab.

Where a locomotive is driven by one man either in shunting or in open track work it is provided that

safety devices are fitted to prevent accidents should the driver become incapacitated. The safety device can depend as well on the length of path as on the time interval. The safety device called dead man control consists of two buttons and steps. If this buttons are not pressed during the motion of the locomotive an audible signal is operated after a certain adjusted time or a distance of 75 metres. If the driver takes no action on this, the locomotive is stopped after a further 75 metres travel respectively after a further interval fixed before by interruption of the power transmission and by the application of the brakes both on the locomotive and the train. The engine continues to run idle.

In order to avoid cold starting of the engine as far as possible and to preclude freezing up during prolonged standing at freezing temperatures, the Jenbach-

locomotives are fitted with Diesel-oil fired heaters for the engine cooling water. These consist of an oil burner to which combustion air is supplied by an electrically driven fan and which heats the cooling water or maintains it at the right operating temperature even at partial load. The heater which also heats the cab can be switched on by manual-push-button or by semi-automatic controls from the cab.

Locomotive designed for operation in arctic temperatures are fitted, in addition, with a steam heating system for the engine which enables the locomotive to operate without special aids at temperatures down to -50°C . Such locomotives are moreover provided with a coke-fired heater in the cab. The locomotive is also suitable for operation in hot climates up to a mean air temperature of 45°C .



TECHNICAL DATA

Model	“Jenbach DH 600 C 48”	
Manufacturers	Jenbacher Werke AG	
Type	C	
Loaded weight, normal	in to	48
Axle load	in to	16
Nominal engine capacity in accordance with UIC-Codex 623	in BHP	600
Power consumption of auxiliary equipment	in BHP	50
Power available for hauling	in BHP	550 (with JW 220 Kv)
Track gauge	in mm (ft. in.)	1000-1676 (3.3 1/2"-5.6")
Fixed axle gauge	in mm (ft. in.)	4500 (14' 9 1/16")
Wheel diameter	in mm (ft. in.)	950 (3.1 1/2")
Minimum turning radius at 10 km/h (6.2min/h) driving speed	in m (ft.)	80 (262)
Fuel capacity	litre (Imp. gal.)	885 (195)
Diesel oil	litre (Imp. gal.)	88 (9.4)
Engine lubricating oil	litre (Imp. gal.)	25,5 (5.6)
Lubricating oil in oil bath air filters	litre (Imp. gal.)	210 (46.3)
Hydraulic oil in the hydraulic gears	litre (Imp. gal.)	33 (7.3)
Lubricating oil in the mechanical gear box	litre (Imp. gal.)	24 (5.3)
Lubricating oil in the axle gear boxes	litre (Imp. gal.)	5,5 (1.2)
Lubricating oil in the air brake compressor	litre (Imp. gal.)	420 (92.6)
Cooling water	kg (lb.)	200 (441)
Sand	litre (Imp. gal.)	600 (132)
Compressed air container—volume	in km/h (miles/h)	30 (18.6)
Maximum velocity in shunting	in km/h (miles/h)	60 (37.2)
open track work	in km/h (miles/h)	80 (49.7)
in hauling		
(delivery journeys)		
Model	“JW 600”	
Manufacturers	Jenbacher Werke AG	
Nominal rating	BHP	600
Nominal revs. p. m.	r. p. m.	1500
Range of revolutions	r. p. m.	750-1500
Number of cylinders		12
Arrangement		“V”-shape
Bore	mm (ins)	150 (5.91)
Stroke	mm (ins)	170 (6.69)
Stroke volume	litre (cu. in.)	36 (2196)
Average piston velocity at rated speed	m./sec (ft./sec.)	8,5 (27.8)
Average effective pressure at nominal load and rated speed	kg/cm ² (lb./sq. in.)	5,0 (71)
Fuel consumption	g/BHP (lb./BHP)	165-175 (0.36-0.39)
Lubricating oil consumption	kg/h (lb./h)	0,6 (1.33)
Battery voltage	Volt	24
Battery capacity	Ah	300
Starter load	BHP	15
Dynamo output	Watt	1000

The engine work on the two-stroke system with reverse scavenging. Together with direct fuel injection into the combustion chamber this brings with it considerable advantages in operation, such as the elimination of all moving control parts, simplified construction, easier maintenance, reduced fuel consumption, high capacity, and very uniform engine torque.

The scavenging air is aspirated by a centrifugal air pump through oil bath air filters and is pressed into the cylinders through scavenging slots in the cylinder liners. The amount injected is automatically adapted, by a speed regulator, to the load at any given moment. The pressure lubrication system which comprises an oil sump in the crank case, a geared pump with a pressure regulator, an oil filter, and a magnet separator, supplies clean lubricating oil, cooled in a heat exchanger, to all lubricating points in the engine.

The engines are started by a Bosch electrical starter motor. The power for this is supplied by a lead battery which is continuously re-charged from an automatically controlled dynamo. The fuel system includes fuel tanks with inspections windows and separators for water and gross impurities, two fuel filters, the fuel pump and the injection pump working in conjunction with the speed regulator, the injection nozzles and the overflow oil line.

The exhaust manifolds pass through two collectors into a resonance silencer to muffle exhaust noise, and are then exhausted into the air above the cab. The noises issuing from the engine and the gears are suppressed by special insulation.

The crank case, the cylinder liners, and the cylinder heads are completely equally cooled by the cooling water. A pump pumps the water through the lubricating oil heat exchanger (for engine and hydraulic transmission) to the engine, and through a tabular radiator whose sections can be removed and replaced individually, where it is re-cooled.

The use of infinitely variable power transmission within additional device to enable the whole set of gear ratios to be doubled renders the locomotives

described exceptionally versatile. The particular advantage of the hydraulic gears consists in the high starting torque and the high degree of efficiency in the upper speed ranges. They are moreover exceptionally reliable in operation and are highly resistant to wear because all parts are running at all times in pure and cool oil. The gears for the "Jenbach DH 600 C 48" locomotive are fitted with two automatically controlled torque converters arranged in series. Both gears require practically no maintenance.

Universal-joint shafts are fitted as flexible couplings between the mechanical gear box and the axle driven in order to compensate for the changes in length and direction resulting from the resilience of the axles. The shafts and universal joints were specially developed for heavy locomotives to withstand the stresses involved.

Since, with hydraulic gears, it is impossible to reverse the direction of revolution, a toothed-wheel gear system is provided which contains the gears for shunting and open track work and the mechanical gear wheels for change of direction. These gears, too are provided with a special lubrication system with oil bath and circulating pump. In order to preclude any damage to the jaw clutches resulting from inexpert operation, a safety device is provided that prevents the locomotive from moving off unless every control operation has been carried out correctly.

The axle drives C 22 V is a intermediate-gear axle drive where the pinion is driven through another pair of gear wheels—the intermediate gear.

The casing is a steel casting and therefore insensitive to outside influences. The bevel gears have curved teeth with the pinion being supported on both sides, thereby ensuring extreme quietness in operation and a perfect meshing of teeth. Mounting the axle drive on the driving axle is effected by anti-friction bearings, their size being determined by the axle diameter. A double-acting geared pump is used to lubricate the gears and bearings in either direction of running. The torque acting on the axle drives is absorbed by sturdy torque reaction supports. Maintenance-free rubber elements have been provided on the vehicle frame for the suspension of the torque reaction supports.

TWO LOCOMOTIVES START 3,500-MILE "PIGGYBACK" JOURNEY

Two brand new diesel-electric locomotives left recently on the first leg of a 3,500-mile long journey to Guatemala.

The trip, from the plant of the General Electric (U. S. A.) Locomotive & Car Equipment Department to the northern terminus of the International Railways of Central America in Tecun Uman, is unique not only for its great length but also because the locomotives are travelling "piggyback"—perched on flat cars.

This novel form of transport is necessary because the locomotives will be used on a railroad with 36-inch gauge tracks. All the tracks between Pennsylvania and Guatemala are of standard U. S. gauge, 56.5 inches wide.

It is believed by officials of General Electric, the company which built the 700 horsepower locomotives, that this is one of the longest piggyback rail journeys on record for a locomotive.

The locomotives are both of the universal-type, meaning that they can be used in passenger, freight and switching service when they are delivered to Central America. The International Railways of Central America is the largest railroad in Central America and operates in both Guatemala and El Salvador. It is expected that the locomotives will play an important role in the vital coffee, cotton and fruit industries in those two countries.

In making their unique journey, the two G-E locomotives will travel over the tracks of several railroads, including the Pennsylvania and Missouri Pacific in the U. S. and the National Railways of Mexico. The locomotives will pass through St. Louis Missouri; Laredo, Texas; Mexico City, and Vera Cruz, Mexico.

Shipment of the locomotives by rail over the entire 3,500-mile distance is made possible by the fact that U. S. railroads and the National Railways of Mexico exchange rolling stock at several points along

the border between the U. S. and Mexico. Both countries, of course, use the same gauge tracks.

In Central America, the new locomotives will join a large number of G-E locomotives ordered previously by various Central American railways. There are, for instance, 19 such make locomotives already operating on the International Railways. Twelve of these are 1,200 horsepower diesel-electrics—the largest ever built for a 36-inch gauge railroad.

During shipment, the superstructures of the two locomotives will be carried on flat cars. The running gear for the two units will be carried on two additional flat cars. The four-car "special shipment" will be intermingled with regular freight trains throughout its journey in both the U. S. and in Mexico.

* * * * *

ANOTHER INDIAN RAILWAY CONTRACT FOR THE BICC GROUP

A further contract for the supply and installation of overhead equipment for 25 kV 50 cycles A.C. railway electrification has been awarded to the BICC Group by the Indian Railway Board. This job is valued at £ 1,200,000 and covers some 300 track miles of the Eastern Railways system. The route to be equipped is on the main line from Delhi to Calcutta and lies between Gaya and Moghalsarai. It forms part of the second phase of the Indian Railway Board's electrification programme and is to be ready for use by July 1961.

The equipment will be similar to that at present being installed by the BICC Group for the South Eastern Railway, the order for which was announced in December 1958. Such rapid progress was made on that scheme that it was possible for a section of the line to be energised only 12 months later so that an electric locomotive could make a demonstration run for delegates attending a meeting of the International Railway Congress Association.

Both contracts were secured in the face of keen international competition.

SOVIET RAILWAY EQUIPMENT NEWS

By N. Zakharov

New Gas-Turbine Electric Locomotive

THE gas-turbine electric locomotive is a new development in motive power. It has a number of advantages over the other types of locomotives. For instance, when compared with a diesel electric locomotive of the same rating, it shows the advantage of smaller overall dimensions and weight per one horse-power.

The gas-turbine which is the heart of the new locomotive makes 8,500 r. p. m. and develops 3,500 HP, burning inexpensive types of fuel, including mazut.

The gas-turbine electric locomotive is fitted with remote push-button control installed in the driver's cab.

The rated speed of the new locomotive is 100 km per hour. It can haul trains weighing 2,200 tons.

This gas-turbine electric locomotive has been built at the Kolomna Diesel-Electric Locomotive Plant (RSFSR).

NEW BATCHING HOPPER CAR

Ballast unloading and filling of tracks is one of the most labour-consuming operations carried out by tracklayers and railway construction engineers. To mechanize this job, special rolling stock, the so-called batching hopper cars, has been designed and is now being mass-produced by the Steam-Engine and Car-Repair Works in Velikiye Luki (the Russian Federation). The first two ballasting trains each consisting of 20 allmetal batching hopper cars have left the works' yard.

When being unloaded the ballasting train moves at a speed of up to 5 kilometres per hour. By using special batching devices mounted on each car, the laid ballast bed depth can be varied from 15 to 30 cm.

Mechanization of ballasting yields a large saving.

It has been estimated that the use of batching hopper cars cuts the expenditure of labour for over-haul of one kilometre of track by 133 man-days. Besides this, unloading losses of crushed rock, gravel and sand are greatly reduced and conditions are being created for the integrated mechanization of track-laying work.



"GI-01" gas-turbine locomotive produced by a plant in Kolomna.

This year the works will produce 500 such batching hoppers.

MACHINES FOR ERECTION OF COMMUNICATION POLES

The Alapayevsk Machine-Building Works (RSFSR) has started the production of crane-type boring machines, for installation of communications line poles.

The boring machine and crane are mounted on a truck and are actuated by a hydraulic system. Two driving axles allow the truck to move across swampy ground at a speed of 60 km. p. h.

Working by hand, a 14-man crew can erect no more than 5 or 6 poles per shift. The crane-type boring machine raises the productivity to 50 reinforced-concrete poles per shift. Only 3 men are needed to operate the unit.

PAINTING AND DRYING INSTALLATION

The Kharkov Railway Car Repair Works (Ukraine) has developed an experimental painting and drying installation. It comprises two separate production lines on each of which two all-metal railway coaches can simultaneously be painted.

On both sides at the entrance to the drying compartments there are special platforms from which two painters, using airgun paint-sprayers, paint the walls of the coaches which slowly move on a conveyor into the compartment. By pressing a button the painter adjusts the height of the platform. Nearby there is

the exhaust ventilator system to draw off the air polluted with the solvent fumes.

The coach is thus moved inside the drying compartment for one hour during which time the entire painting process is completed.

The painting and drying installation is controlled by one operator, who regulates the coach movement, closes and opens the drying compartment gates and controls the ventilators and motors. The control desk is fitted with a "talk-back" facility (a telephone-microphone communication line), enabling the painters to report on the completion of the painting and the full entry of the coach into the drying compartment.

The compartment gates close automatically after which steam is introduced and hot air is forced through heater batteries into the compartment by powerful fans. The temperature in the compartment is raised to 70-80 degrees Centigrade and the car is dried out in two hours.

During this time preparatory work is done on the next coach, and the one that has moved out of the compartment gets numbers, the railway owner code and the decorative strips.

Leclanche Type Dry Batteries

The Indian Standards Institution has recently published IS: 586-1959 Specification for Leclanche Type Dry Batteries for Telecommunication, Signalling and General purposes (Revised). The standard prescribes the dimensions, tests and performance requirements of Leclanche type cylindrical dry batteries of nominal voltage of 1.5 V and intended to be used for telecommunication, signalling and general purposes under the climatic conditions prevailing in India.

This standard is a revision of the same specification published in 1955. The revision has been done in the light of experience gained during the currency of the standard. The following are the main modifications:

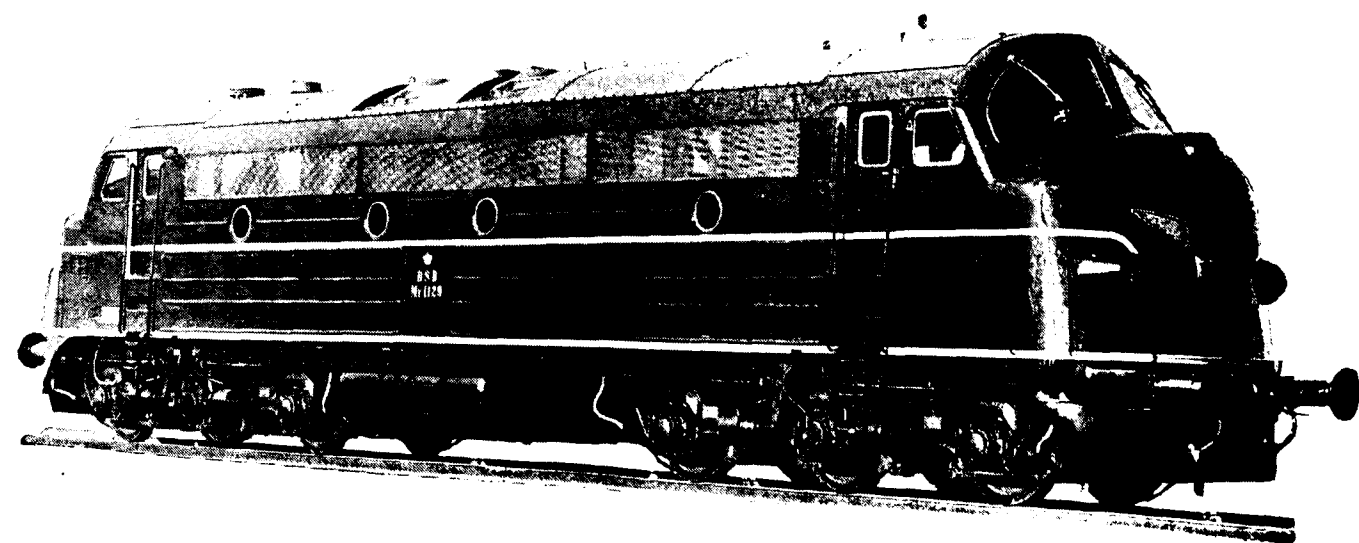
(a) The designations of batteries have been modified to conform to IEC practice.

(b) Tests and requirements have also been aligned with the IEC Recommendations, as far as practicable.

(c) Definitions of terms originally included as part of the standard have now been deleted. These definitions have been covered in a separate standard, namely, IS: 1025-1957 Glossary of Terms for Primary Cells and Batteries.

(d) Reference to internal constructional details of the cells has been deleted.

(e) The rated life and performance requirements under delayed continuous discharge test have been slightly raised in the light of experience and progress in the manufacture.



Economy on rails

Efficiency, reliability, and economy are outstanding features of the NOHAB-GM diesel-electric locomotives.

Interesting figures on the economy of these locomotives were obtained when the Danish State Railways (DSB) compared their operating costs for the NOHAB-GM locomotives with those of steam locomotives. The four diesel-electric locomotives first procured showed savings of 678,000 Danish crowns (£35,300) per year per locomotive. 20 NOHAB-GM locomotives delivered later have saved about half a million Danish Crowns each annually, in fuel costs only.

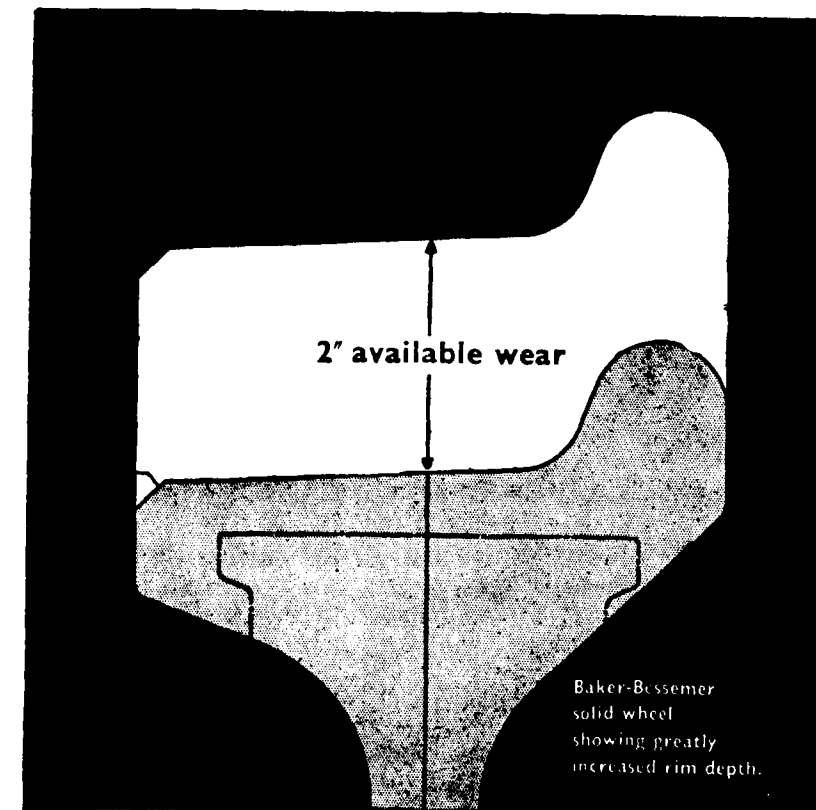
A new order for 45 locomotives of a similar type proves that the NOHAB-GM diesel-electric locomotives already delivered have given full technical as well as economic satisfaction.

The bogies are made according to the so called flexi-coil principle, with axles displaceable in the journal boxes, which gives the locomotives an extremely smooth and even running.



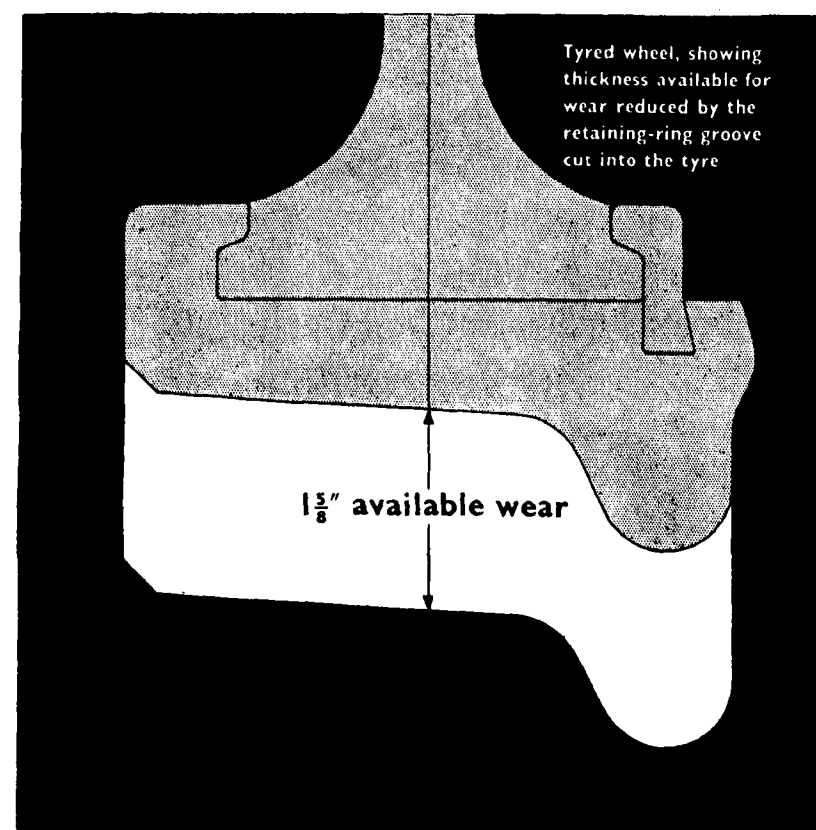
NYDQVIST & HOLM AKTIEBOLAG, TROLLHÄTTAN, SWEDEN

Cables: NOHAB Rhone: 18000 Telex: 5284

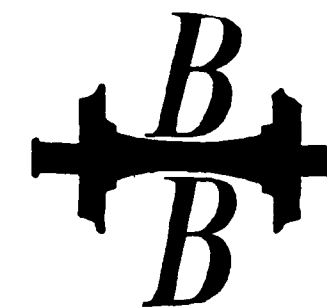


The solid wheel has an initial life 20% greater than the corresponding type of tired wheel. This is fully illustrated by a comparison of the solid wheel, I.R.S. Drawing No. WA. 22, and the built-up wheel to I.R.S. Drawing No. WA. 23.

More than 20% increase in life



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CRANE WEIGHING MACHINES

The Indian Standard Specification for Crane Weighing Machines (IS: 1438—1960) published recently by ISI belongs to a series of Indian Standards on commercial weighing instruments being prepared at the instance of the Standing Metric Committee, Government of India, in connection with the introduction of metric system of weights and measures in the country. The other standards published in the series cover the general requirements for weighing instruments, and specifications for beam scales, counter machines, platform weighing machines, weigh-bridges, automatic weighing machines and steel yards.

In determining the limits for sensitiveness and greatest error, due consideration was given to the views of manufactureres and testing organizations, prevalent rules and regulations pertaining to weights and measures in India and the practices current in several metric countries. It is to be pointed out that the values for sensitiveness and greatest error specified in this standard are for new machines only.

* * * * *

ELECTRICAL CABLES, CONDUCTORS
AND SLEEVING

The following four draft Indian Standard Specifications are about to be issued by ISI for wide circulation for eliciting comments :

- (1) *Draft Indian Standard Specification for Rubber-Insulated Cables and Flexible Cords for Electric Power and Lighting (for Working Voltages Up to and Including 1.1kV) — Revision of IS: 434—1953 [Doc: ETDC 2 (102)]*—This revision has been undertaken mainly to introduce metric system in this standard. The conductor sizes are based on Indian Standard Metric Sizes of Wires and Conductors for Electrical Purposes Doc: ETDC 2 (47) (under preparation). In addition, this revision incorporates the accepted recommendations of the Commonwealth Standards Conference on Cables held in New Delhi in 1957. This

also incorporates amendment No. 3 to IS: 434—1953.

- (2) *Draft Indian Standard Specification for Aluminium Conductors in Insulated Cables [Doc: ETDC 2 (84)]*—This specification has been prepared to cater for the increasing use of aluminium conductors in insulated cables. This draft, however, confines itself to the requirements of the aluminium conductors but does not give any requirements or tests concerning the insulation of the cables for which reference has to be made to the corresponding Indian Standards for insulated cables with copper conductors.
- (3) *Draft Indian Standard Specification for Polyvinyl Chloride Sleeving [Doc: ETDC 2 (105)]*—This document covers plastic sleeving which are used to insulate the bare conductors in light electrical appliances, such as radios. These sleeveings are also used in aircraft electric cables. In this draft, an attempt is made towards standardization of dimensions and wall thicknesses in addition to specifying the performance requirements.
- (4) *Draft Indian Standard Specification for Braided Cables with Copper Conductors for Overhead Transmission Lines [Doc: ETDC 2 (98)]*—This specification covers cables with braiding over them used for overhead transmission purposes particularly in locations where such overhead lines pass through trees or similar obstructions. These cables are not considered as insulated cables but as cables with some amount of mechanical protection over the conductor. The draft lays down mechanical requirements such as the tensile strength and also some requirements of the braiding.

These draft standards are being circulated for eliciting technical comments to producers, consumers, technologists and other interests concerned.

ALUMINIUM-ALLOY INGOTS AND CASTINGS

The Indian Standards Institution has recently published IS: 202—1960 Specification for Aluminium-Alloy Ingots and Castings for Aircraft Purposes (*Revised*) which covers the requirements of eight aluminium-base alloys, in ingot form for remelting for the manufacture of castings, and aluminium-base alloy castings for aircrafts purposes.

This standard was first issued in 1950 as a tentative standard. As a result of the experience gained by the industry in using this tentative standard, it was decided to revise it and to issue it as a firm standard. The main modifications made in this revision relate to certain changes in designation, chemical composition, mechanical properties and inclusion of four more alloys.

This standard is one of a series of Indian Standards for aluminium and its alloys for aircraft purposes, prepared at the instance of the Aircraft Industry and the Directorate General of Civil Aviation. Other standards in the series are :

IS: 23—1959 Specification for 99 Percent Primary Aluminium Notched Bars and Ingots for Remelting for Aircraft Purposes (*Revised*)

IS: 30—1953 Specification for Aluminium-Coated High-Tensile Aluminium Alloy Sheets and Coil for Aircraft Purposes.

* * * * *

COVERED ELECTRODES FOR
THE METAL ARC WELDING

The Indian Standards Institution has recently published IS: 1442—1959 Specification for Covered Electrodes for the Metal Arc Welding of High Tensile Structural Steel which lays down requirements for covered electrodes of 2.5 mm (or 12 SWG) and thicker sizes for manual metal arc welding of high tensile steel. The type and quality of an electrode play a very important role in getting welds of required characteristics. The performance qualities of an electrode should be such that satisfactory weld deposits can be made by a welder of average skill and experience working under normal conditions existing at the site of work. This standard lays down requirements of covered electrodes used in metal arc welding of high tensile structural steel having a

maximum tensile strength of 68.0 kg per mm² (or 43.0 tons per in.²) and maximum yield stress of 44.0 kg per mm² (or 28 tons per in.²).

In the past, the absence of a specification for electrodes which deposit metal having tensile properties in excess of those of mild steel has meant that the stresses in welding joints in higher tensile steels have been limited to those which were permissible in mild steel. The use of this specification will ensure that the electrodes are capable of depositing metal having tensile properties comparable with those of high tensile structural steel thus enabling such steels to be used more economically.

This standard is one of a series of Indian Standards on covered electrodes for the metal arc welding of steel. Other standards published so far in the series are :

IS: 814—1957 Specification for Covered Electrodes for Metal Arc Welding of Mild Steel

IS: 1395—1959 Specification for 1/2-Percent Molybdenum Steel Covered Electrodes for Metal Arc Welding

* * * * *

HORIZONTAL CENTRIFUGAL PUMPS

The object of IS: 1520—1960 Specification for Horizontal Centrifugal Pumps for Clear, Cold, Fresh Water published recently by ISI is to provide guidance to both manufacturers and users of horizontal centrifugal pumps for clear, cold, fresh water. The specification covers only the minimum essential details for good quality horizontal centrifugal pumps. The standard is divided into three sections. The first section covers terminology, nomenclature, standard units, classes and types, direction of rotation, accessories, and suction limitations of the pumps. The second section gives details of information to be supplied by the purchaser. The third section, besides detailing information to be furnished by the supplier, covers pump tests, guarantees, tolerances and general requirements.

The specification is not intended to be restrictive in character and, subject to agreement between the purchaser and the supplier, some of the requirements of this specification may be either modified or made more elaborate.

Equipment for Indian Railways—Contract Signed with U.K. Firm

A further contract for the supply and installation of overhead equipment for railway electrification has been awarded to the British Insulated Cables Group by the Indian Railway Board, the group announced on 23—6—60.

The contract is valued at £ 1,200,000 (Rs. 15 million) and covers some 300 track miles of Eastern Railways system on the main line from Delhi to Calcutta. It is to be ready for use by July, 1961.

* * * * *

RAILWAY ENGINEERS CONFERENCE

A five-day conference of Chief Engineers of Indian Railways concluded on 21—6—60 at Simla. The conference discussed the question of strengthening the track to avoid possible dislocation of rail services caused by breaches and landslips. Other engineering matters connected with railways were also considered.

* * * * *

The Telegraph Condenser Company Ltd., of the United Kingdom, and Sprague Electric Company, of the U. S. A., announce that they have come to an arrangement whereby:—

- (a) T. C. C. acquire the right to all Sprague United Kingdom patents and applications, together with the technical and engineering information necessary to exploit them,
- and (b) Sprague will make available to T. C. C. all its present research and technical information and engineering knowledge and for the next 21 years the two companies will exchange research, development and manufacturing knowledge, extending beyond the field of capacitors and embracing all the products of the two Companies.

Both Companies are confident that as the leading manufacturers of capacitors in their respective countries, their close co-operation in research and manufacture will be of the greatest benefit not only to T. C. C. and Sprague but also to the Electronic Industry as a whole.

An Australian Design of Diesel-Hydraulic Locomotive

PERHAPS Australia does not come readily to mind as a country building diesel locomotives, but in fact some 490 have already been built there and their number is increasing each year.

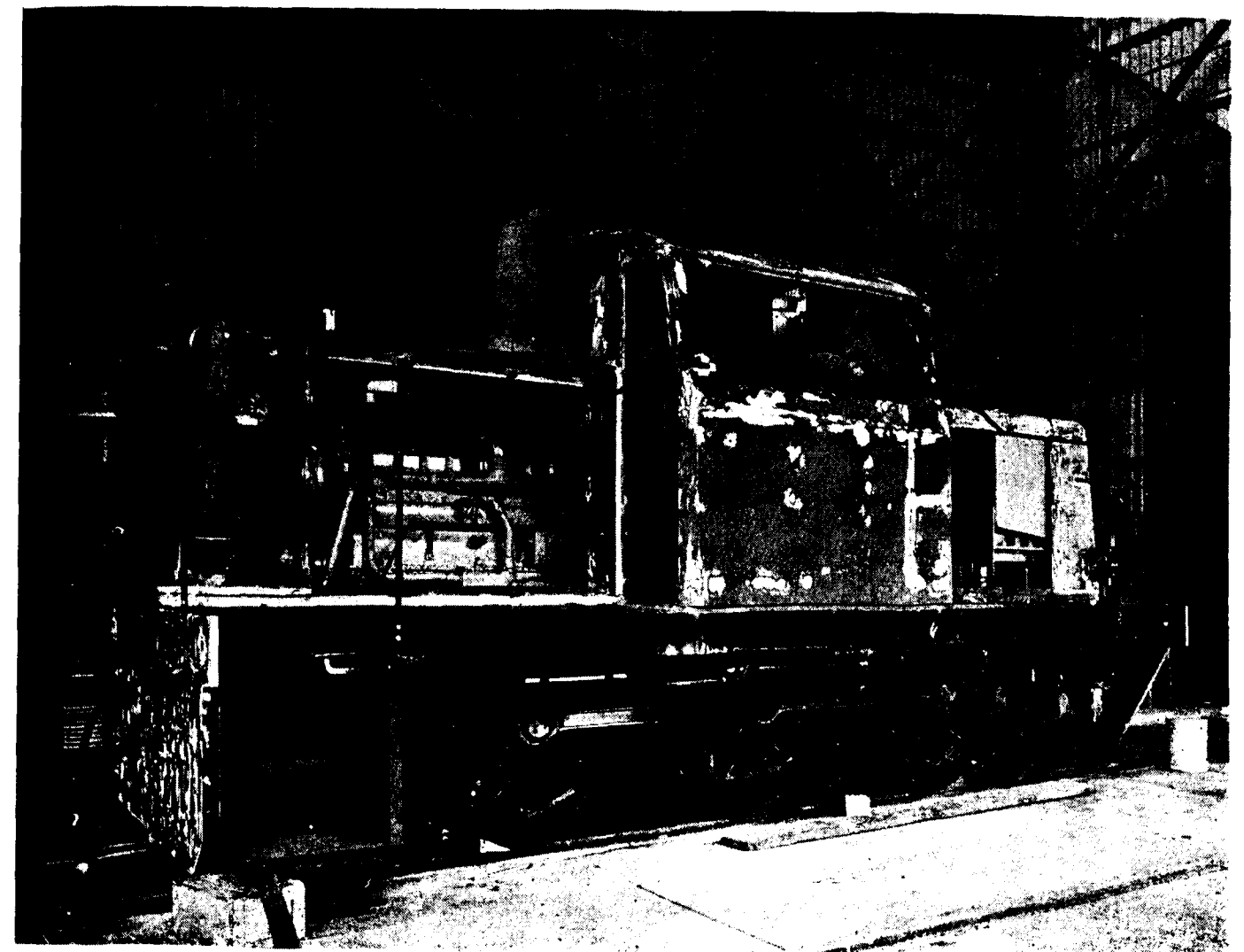
Because of climatic conditions ranging from tropical to sub-freezing, vast arid areas with their dustbowl conditions and the sparsely populated areas from whence come huge tonnages of her primary products, the diesel locomotive designed and built in Australia to meet the local conditions compares more than favourably with its counterpart built elsewhere in cost, service and demands for maintenance.

The railway Authorities in all the Commonwealth

States are constantly showing their confidence in the Australian product as they replace their obsolescent equipment.

In general, the Australian built diesel locomotive, apart from the smallest units, is equipped with imported components for its power source and transmission system. The frame is designed and fabricated by the builder who often procures sub-assemblies such as wheel-sets, coupling rods and draft gear, made to his designs, from local works especially tooled for their manufacture.

Building of the locomotive takes place on assembly lines, provided with pit facilities and overhead crane service, and machine tools and workbenches located



THE ARCHITECT'S DREAM COME TRUE!

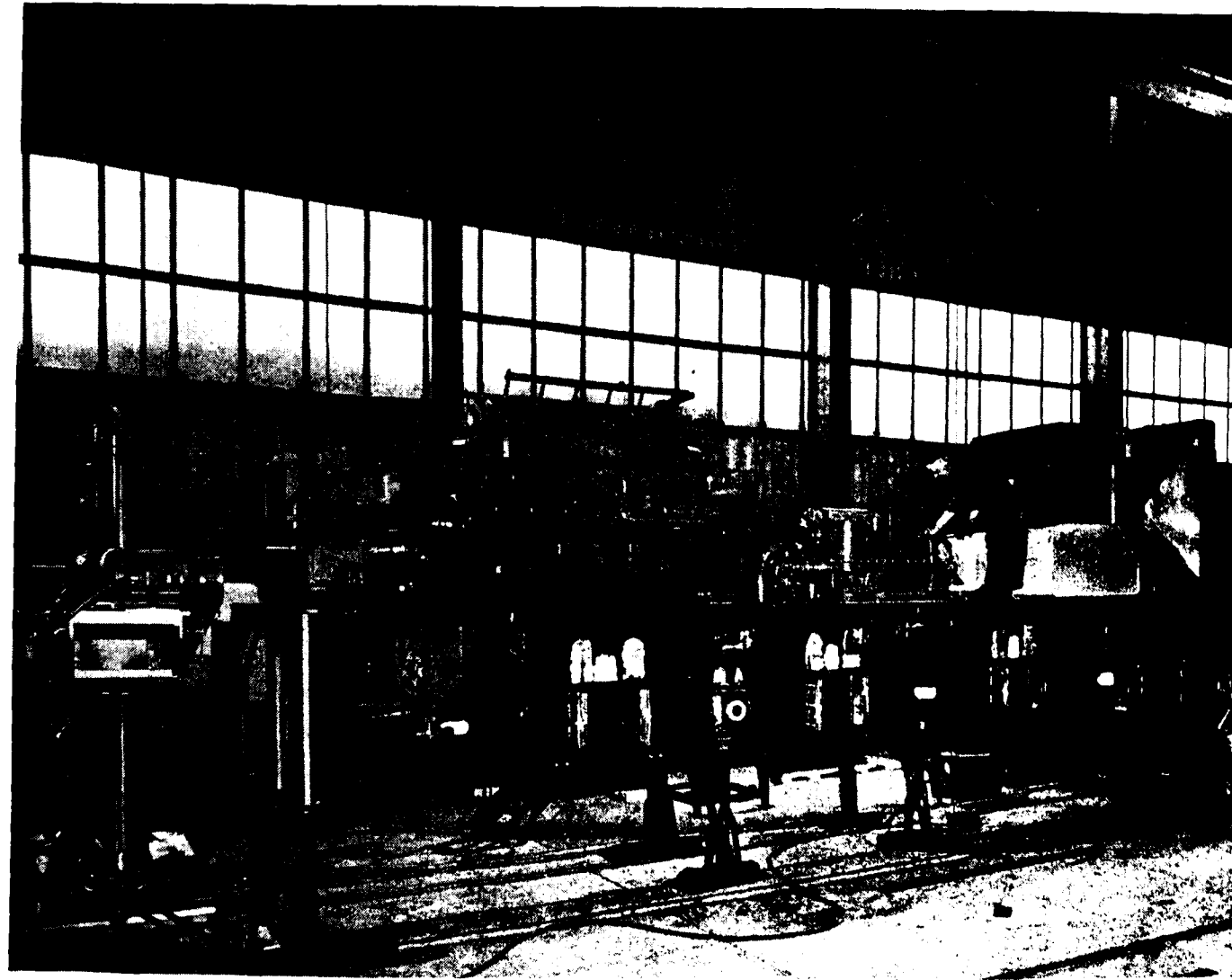
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alongside. Full use of portable power tools is made at all times.

In Australian railway working a particularly important role is played by locomotives in shunting duties at yards and sea terminals and in service on secondary lines operating through the back country. In both cases, dependability and economy together with easy handling and maintenance are pre-requisites for satisfactory performance. Well worthy of note in their successful satisfaction of all these sought after features are the diesel-hydraulic locomotives designed and built by Tulloch Ltd. at Rhodes, NSW.

By their well considered choice of components, Tulloch Ltd. has developed a class of diesel locomotive that, without shock, provides for both constant and stepless variations in power being available at the wheels from a single manual control.

These units are available in the 200—1,000 h. p. range (20—60 tons) with optional wheel arrangements of 0—4—0, 0—6—0 or B—B. The Tasmanian and the Victorian State Railways, between them, have already ordered 27 locomotives of the 0—6—0 type. The individual requirements of these two railway systems differ both in rail gauge and power output, but the basic design is unchanged on their account and has proved itself to be very satisfactory on both railways by the units already in service on each.

Tulloch Ltd.'s 0—6—0 locomotive takes the power from the diesel engine through a flexible coupling and cardan shaft to a Krupp Hydraulic two-speed transmission which delivers its output through a second cardan shaft to a combined "Bevel-Spur" gear on one axle shaft and the drive taken to the other wheels through side coupling rods.

Normally, Daimler-Benz engines are fitted. Their fine service records throughout the world are well-known, and being available in either six or twelve cylinder units, with or without superchargers, permit coverage of a wide range of output power with a substantial interchangeability of working parts between the differently rated engines.

The transmission comprises a variable blade torque converter, at all times filled with fluid, driven through a built-in step up gear from which the power flows through either of two constant mesh gear trains of different ratios to two final gear wheels turning freely and concentrically over the output shaft on independent roller bearings set in the transmission case. The final gear wheels include dogs on their inner hubs which can be engaged by a correspondingly dogged sliding sleeve splined to the output shaft of the transmission, to provide either forward or reverse movement. The change in direction is compressed-air

operated and protected against the shift being made unless the locomotive is at a standstill. A manual lock to the 'neutral' position allows haulage of a dead locomotive with security.

Noteworthy too, is the economy in fuel realized on light duties, because much of such work can be carried out with the engine idling and meeting the tractive demand by merely varying the torque converter blades.

In operation the choice of gear ratio will be decided automatically as a functional combination of road speed-load-engine output, so that effective control for working the locomotive is reduced to one lever.

The change in gear ratio is accomplished through two multiple plate clutches, hydraulically controlled both as to their engagement and application pressure, which without breaking the flow of power to the



driving wheels bring into use one or other of the gear trains, as required by the load. Usually the gear change is adjusted to occur at about one-half of the maximum road speed. No fluttering between the two ratios can occur, because the automatic change up to the higher gear ratio is made at a road speed greater than that bringing about the downward change.

By variation of the design and its internal lay-out, power may be transmitted to several final points of output, as in bogie arrangements, from a single source of power. For bogie drives, by the use of twin torque converters and individual gear trains within a single housing, power is taken to each bogie without any possibility of the transmission becoming 'wound up' by road curves or even by the wheelsets of one bogie differing appreciably in diameter from those of the other.

The axle gear is constituted by bevel and spur gears carried in a substantial housing from which extends a reaction arm anchored to the locomotive bogie frame through flexible bushings. Optional over-all gear ratios enable the designer to combine any load requirement with efficient utilization of power.

Radiator cooling for the engine and the heat exchanger for the transmission's fluid is set at one end of the locomotive. In the higher power range, the equipment includes a variable-speed fan operated by a thermostatically controlled hydraulic motor. The power absorbed by the fan is at all times only that necessary for the actual cooling needs, leaving additional power available for traction and the realisation of substantial economies in fuel.

All axles of the locomotive turn on roller bearings whose housings carry the weight of the unit through a compensated system of laminated springs. Axle box guides are fitted with replaceable manganese wearing plates on rigid frame cases. Coupling rods can either be plain or roller bearing.

Westinghouse air-brake equipment is fitted. Power to the compressor is taken from the engine either through "Vee" belts or a direct coupled reduction gear. Vacuum brake equipment is optionally fitted.

Other mechanical parts are of simple and robust design, and in accordance with well established locomotive practice.

The locomotive superstructure provides for a centrally located cab with steel housings fore and aft

protecting the engine and ancillary equipment against the elements. Large doors in the housings give easy access for servicing all equipment from surrounding walkways.

The cab, insulated against heat and noise, is fully glazed for clear vision all round, the side windows may be opened. Inside, a central panel groups the tell-tale instruments (Gauges, Thermometer, Ammeter and Warning Lights Etc.) at eye level and a central desk carries the controls for all equipment (Electric starter, lighting etc.).

All driving controls are duplicated to the side of the cab for right or left hand working from comfortable seated positions.

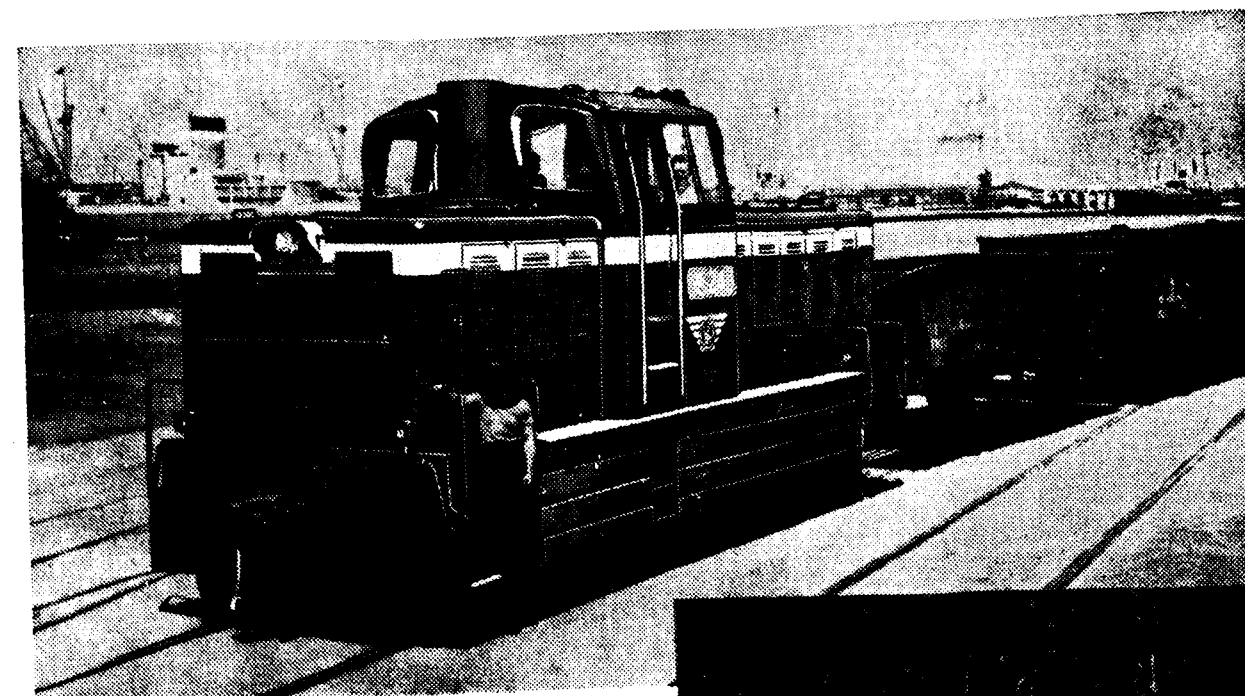
For multiple operation one driver controls one unit, without need for anybody to be near the other units. Each locomotive will, of its own accord, take its fair share of the load at all times.

The principal characteristics are tabulated:

	Tasmanian Rlys.	Vict. Rlys.
Locomotive weight	29 Tons	48
Wheel arrangement	0-6-0	0-6-0
Track gauge	3 ft. 6 ins.	5 ft. 6 ins.
Nominal power	330 HP.	650
Maximum speed	30 m. p. h.	40 m. p. h.
Minimum track curve, radius	150 ft.	200
Maximum Starting T. E. @ 30% adhesion	18,500 lbs.	32,250
Continuous T. E. @ 5 m. p. h.	15,000 lbs.	29,200
Engine Data :		
Maker	Rolls-Royce	Daimler-Benz
Model	C. 8. T. F. L.	MB 810
No. Cylinders & Arrangement	8 in line	12-60
Maximum Governed Speed	1800 rpm	1500 rpm
Transmission & Axle Gear Data :		
Maker	Krupp	Krupp
Transmission Type	2 W I L I 15	2 W I D 46
Axle gear Type	KS-320	KS-620

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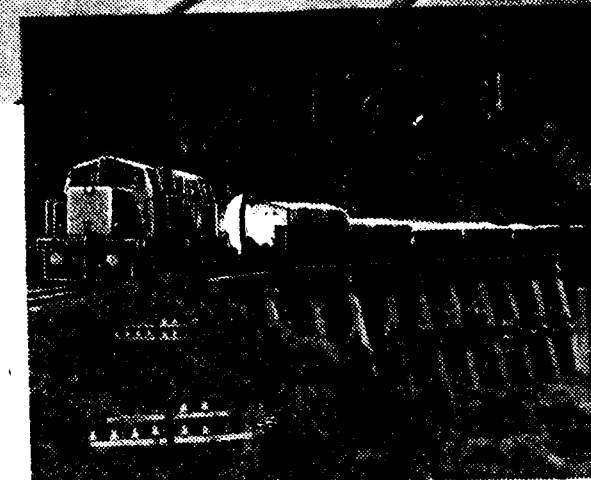
DIESEL-HYDRAULIC LOCOMOTIVES



Above: 700 H.P., 0-6-0 Tulloch-designed, Tulloch-built Diesel Hydraulic Locomotive for shunting and transfer work, one of an order of twenty-five for the Victorian Government Railways, Australia. The design incorporates 12 cylinder Mercedes-Benz diesel engine, Krupp hydraulic transmission and axle gear and Behr hydrostatic cooling plant.

At right: 350 H.P., 0-6-0 Tulloch-designed, Tulloch-built Diesel Hydraulic Locomotive for shunting and secondary line operations on the Tasmanian Government Railways, Australia. Power is supplied by a Rolls-Royce 8 cylinder turbo-charged diesel coupled to Krupp hydraulic transmission.

A feature of Tulloch design is roomy cab layout with extreme simplicity of controls.



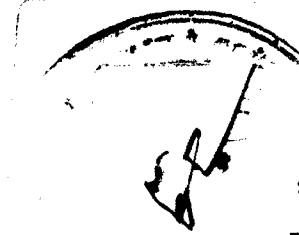
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LOCOMOTIVE DIVISION

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SYDNEY, AUSTRALIA

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