

PEOPLE'S HEALTH



EDITOR
A.V. RAMAN



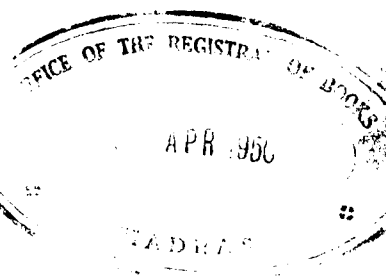
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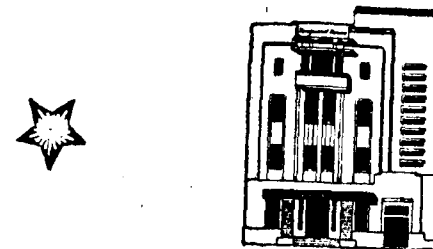
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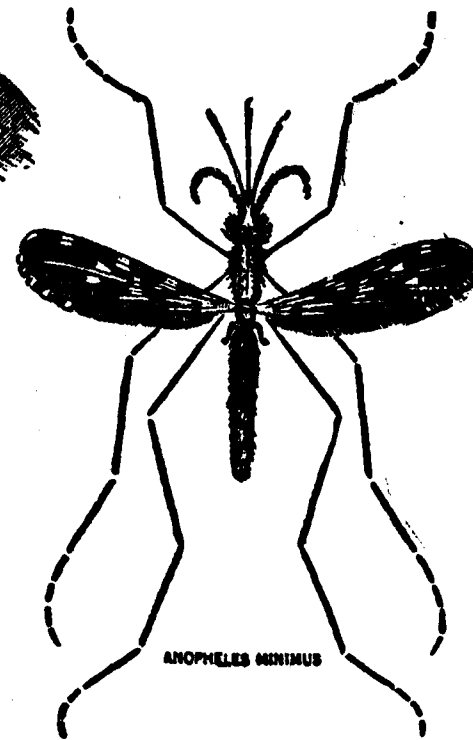
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MALARIA—THE MENACE THAT MATTERS

**KNOW
YOUR
ENEMY!**

REGIONAL MALARIA
CARRIERS NO. 1

**ANOPHELES
MINIMUS**



DESCRIPTION		SPHERE OF INFLUENCE	
Tips of hind legs not white. Femora and Tibiae not speckled. At least 4 dark spots on Costa and 1st longitudinal vein. Tarsal segments of	forelegs unbanded. Third longitudinal vein entirely pale. Palpi of female with two pale distal bands both broad separated by a dark band of equal width.	Foothills of U.P. Bengal: Assam: Burma: Indo-China: S. China.	low down, frequently hanging from horizontal surfaces.
		ADULT RESTING PLACES	PREFERENTIAL FEEDING HABITS
		Human dwellings	Marked preference for human blood.

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PEOPLE'S HEALTH

A Pioneer in the Field of Public Health

Vol. IV

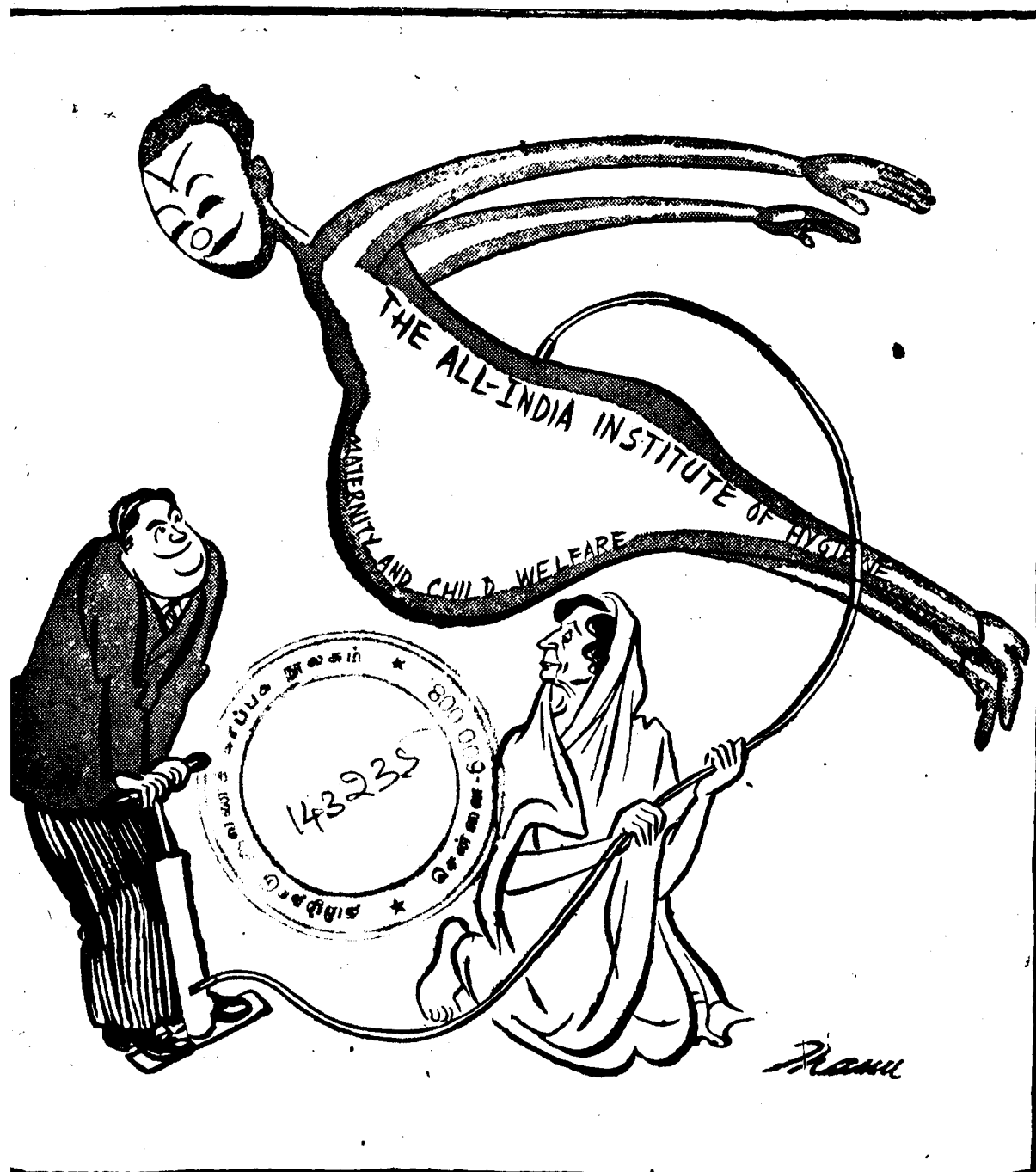
MARCH, 1950

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The Health Ministry of the Indian Republic takes the lead of WHO of UNO to develop maternity and child welfare in the All India Institute of Hygiene, Calcutta.



VOL. IV No. 6

MARCH, 1950

ISSUED MONTHLY

EDITORIAL . . .

Fools make feasts, and wise men eat them
—ENGLISH PROVERB.

INDIA'S HEALTH POLICY

Ordinarily the health policy of a country is determined by the government of the country. In our infant Indian Republic, however, the policy is determined by foreign interests. An international body like the WHO, in effect, decides what health policy should be followed in this country! That it is so, will be evidenced by the achievement of our Ministry of Health for 1949-50. The two grandiose schemes, (yet to bear fruit) are: the construction of a factory to produce pre-fab houses and the flounder of BCG-vaccination. It is said that, besides these, some additions have been made to certain medical institutions managed by the Central Government. What a glorious twelve months' hard work!

"The Proof of the Pudding"

In reply to a volley of questions which Mr. H. V. Kamath shot at the Minister

of Health, Hon. Rajkumari Amrit Kaur, presumably administering the perfect squelch, retorted that, the proof of the pudding is in the eating. We are yet to see a chef who would boldly prepare tons of pudding without testing even a single one. This is commonsense and every housewife knows it. After Coleman (Jr.) we are inclined to remind the Hon. the Health Minister of India:

"The proof of the pudding is in the eating", which is a precept to trust only to absolute experience.

Irresponsible

Mr. H. V. Kamath and Mr. Mahavir Tyagi, two of the few non-toadying M. Ps., took up the question again on the floor of the House so recently as 23rd March, 1950. From the Health Minister's answers and her refusal to enquire further into the pre-fab policy, it is clear that India's health

needs to be handled differently. As a sop to Cerberus, it was suggested that some Indians would also be trained in the technique of the design and manufacture of pre-fab houses. We wonder what difference there is between the foreigners fostering their interests in this country directly and Indians in authority, continuing the tradition, falling victims to western vested interests!

A Scientist's View

We are not alone in our condemnation of the housing policy; Prof. T. D. Bernal, an eminent British scientist, has stated as under:

Prof. Bernal dwelt at some length on the deplorable conditions of housing all over the country. He said little effort was being made to evolve large-scale plans of housing based on available indigenous materials. Some effort was made in this direction now, notably in Roorke, but he regretted that administrators generally were drawing "grandiose" plans on the model of European conditions totally unsuited to India. In this connection, he was surprised to note the Indian Government were building a prefabrication factory in Delhi when even in this country it was found that prefabricated houses were too costly and beyond the means of people for whom they were primarily intended.

An opinion expressed by so high a scientific authority cannot be summarily ejected.

The Latest

India's Health Minister has to wait for the WHO to give the lead, before she takes up the cue. The latest is the lead from the WHO to develop in the All India Institute of Hygiene, maternity and child welfare activities. Experience would undoubtedly indicate that this section might be developed out of all proportion and to the prejudice of the other activities of the Institute. After all, one might ask whether child welfare and maternity are so vital and urgent as to be pushed to the forefront. We fear this latest aid from abroad might turn to be more harmful than beneficial; the good work done by the Institute hitherto is likely to be hampered, thanks to its proposed lopsided development.

BCG Vaccination

On this subject, we have split enough printers' ink to no avail. It is often said on platforms, even by the imported specialists that BCG alone cannot, in the very nature of things, eradicate tuberculosis from our midst. We ask what other recognised steps have been taken by the Ministry of Health. Have not the Ministry pinned all their faith in a single questionable measure and built all their hopes of a TB-free nation on an insane fascination for BCG?

ORGANISATION OF HEALTH SERVICES IN INDUSTRY

7. DOCTOR'S ROLE IN INCREASING INDUSTRIAL EFFICIENCY

by

Dr. M. N. Gupta,

M.B., B.S. (Pb.), D.P.H. (Lond.), D.I.H. (Eng.),
Deputy Chief Adviser Factories (Medical),
Ministry of Labour, New Delhi.



(NOTE.—The views expressed in the article are not that of the Government.)

The real function of a doctor in industry expresses itself in his ability to secure the wholehearted and intelligent co-operation of the worker in the fulfilment of a given purpose—procurement to the worker of a state of complete physical, social and mental well-being and not just the absence of disease or infirmity.

The factory may be best designed, the manufacturing operations may be perfect, the factory organisation may be most scientifically planned, but nothing will secure complete physical, social and mental well-being to the workers as good relations between them and the doctor, on which their efficiency essentially depends.

The doctor's first responsibility is to render service to the industrial community in which he practises his art of healing. With the development of human needs, the need for medical assistance also developed. Even in primitive society the "witch doctor" had his privileged place and a social status. Today that is impossible, and we have to have properly qualified medical men to administer to our physical, social and mental illnesses. But through all this change, the doctor's responsibility has remained unaltered—the rendering of service to the community. The

well-being of our workers whom we call the "producers of wealth", depends on an increasing appreciation of this view of medical service.

The next point worthy of consideration in this respect is that that service should be rendered on terms which are fair and equitable to the workers. That means, a reasonable standard of health should be provided to the workers in return for their willingness to accept the not-too-pleasant working environment of industrial life. One cannot, however, enter into the controversy as to what is a reasonable standard of health. That is a function of the physiologist to state. What lies in the domain of the works' doctor is to secure those minimum standards of industrial environment which are conducive to the attainment of complete physical, social and mental being to the workers on his medical charge. This function of the works doctor demands not only professional acumen but qualities of head and heart of a high order.

This conception of the functions of a works doctor, carries with it as a corollary, the idea of teamwork or joint partnership between those who render the service and those who receive the service, to offer to each other mutual obligation

and shoulder responsibility in order to make one's own essential contribution to the common interest.

A step of this nature is essential to the understanding of the medical problems of our industrial workers. For, if there is one problem in industry in which there can be no conflict between the work-people in industry and their employers, it is the problem of medical care. This problem, also incidentally is of common interest, as it provides for the prosperity of the industry and for employment of a healthy labour force. While the interest of workers lies in enjoying a healthy life in their industrial environment, the employer is also equally interested in cutting down his health bill, reducing sickness absenteeism and increasing productivity of the employees.

Worker and His Health Problems

To begin with, the works doctor and the management should understand the scope of medical work in industry which includes not merely the physical but the whole health of man, not the saving of life and limb but the saving of health. The scope should lay stress on the evaluation of causes of morbidity and mortality. So also within the scope of investigation should come not only the individual worker but his family and his home and social environment should be studied along with his industrial work environment. "A man is body, mind and spirit" and industrial medical service must take cognisance of that fact.

Besides the problems of wages, hours of work, etc., which worry the workmen's mind, it must be remembered that the workman of today wants to understand and know his other problems also. And that is a happy augury, for, with that state of mind he is in a receptive mood and shall be able to understand the value of all health programmes in industry.

Constructive Health Policy

It becomes obvious from what has been said above that a solution to health problems can

be found by the adoption in each undertaking of a constructive policy for the building up of the health of the labour force.

It is only recently that the importance of a health policy has come to be realised by industry, for we have all been very busy in recent years in learning the structure, technique and methods of organisation of our industries to suit modern requirements. And it is in the fitness of things that we are beginning to appreciate adequately the need for a modernisation of our attitude towards the health problems of our workers.

We must not overlook the fact that the various new Acts that have come on the Statute Book after the war like the Factories Act, 1948; State Employees' Insurance Act, 1948; Industrial Relations Bill, are a result of the change in mentality and outlook of our workers. All our health programmes should be governed by and conducted in accord with a considered and progressive health policy.

The responsibility for the adoption of that policy belongs to those who are the directing brains of the undertaking. The Medical Officer should play his part with vigour in the formulation of a policy which should not smell of benevolence towards the employees. A good health policy can never be built without the active co-operation and understanding of the participants and the beneficiaries of the scheme.

Once a healthy policy has been framed, the second stage is to ensure that that policy is thoroughly appreciated and understood throughout the organisation. Each doctor will have his own method of doing this in order that harmonious co-ordination of various programmes is conducted in accordance with the firm's considered policy.

One thing which needs emphasis here is that the doctor should be on the lookout of possibilities where the good intentions of the firm may not be vitiated by ignorant or unsympathetic employers or workers. To obviate such possibilities

the doctor should spend considerable time in the works for the education of the workers and other staff for whose benefit the policy is to be introduced.

To sum up, the requirements of a health policy should be—

(i) to educate the management and the employees to the implications of a health policy;

(ii) the policy should be of the nature of a joint enterprise in which everybody takes equal part and makes his contribution to the success of the scheme;

(iii) the maintenance of a high standard of working conditions, consistent with the recognised hazards of the industry;

(iv) plans for making the scheme as complete as possible and increasing the scope of the scheme as far as possible;

(v) plans for meeting together regularly to discuss the day-to-day health problems.

Individual Consideration

Another feature of this health policy should be the adoption of measures which will foster good relationship between the doctor and individual patient. It should make the prospective employee realise that the medical department is a place where he can depend upon genuine help and consideration and the doctor commands his trust so that no confidential information regarding the medical state of his health is known to unauthorised people. Such a policy will give each individual employee due consideration as an individual and reasonable opportunity to have free consultation of the works doctor to administer to his mental and physical ailments.

The first step in this direction can be taken if the health policy includes a plan for pre-placement medical examination of the worker. Every misfit means ill-health and inefficiency. A proper placement by the physician will obtain for the worker the greatest personal satisfaction. The doctor must lay more stress and attention to the correct placing of the individual.

A progressive health policy must adapt itself to the mental and moral make-up of the workman of to-day.

The Works' Doctor fills the Gap

An industrial physician by virtue of his specialised training in such subjects as industrial light, heating, ventilation, engineering, evaluation and control of dust hazard, industrial toxicology cannot, however, be expected to work as a specialist for we know quite well that engineers, physicists and chemists who specialise in these subjects are much better informed. The role of a works doctor can only be that of an adviser on such problems. His field of speciality, however, remains the same for ever—that is, supplying to the industry his speciality, clinical knowledge, clinical appreciation or perception. His "doctoring" is the *alpha* and *omega* of his usefulness to industry. In making this contribution he improves the morale and the employee-employer relationship and in his advisory capacity improves the environmental hygiene of the works. He is a link in the chain of specialist services required by modern industry and his efficiency in this capacity depends on his "ordinary" medical knowledge.

The Requirements of the Physician in Industry

If the standard of industrial medicine is to be maintained and also the maximum efficiency of the medical officer, the industry in its turn should provide the Medical Officer two things:—

- (a) his professional prestige; and
- (b) material for his clinical knowledge.

(a) *Professional Prestige*.—If the relationship between the patient and the doctor is good the practice of medicine in industry will be successful. It is essential to have a generous increase of reciprocal confidence between the doctor and the employees, and this state of affairs can arise only when the medical officer does not become a part of management or a tool of management but remains a part of medical profession and

is allowed free hand in the running of his medical department without any bias from the opinion of the management. The management must learn to recognise the essential function of the Medical Officer to avoid creation of a gulf between it and the doctor. The doctor in industry must be provided facilities and allowed to build up the same prestige for himself that a general or private practitioner builds up by having intimate knowledge of his patients' lives. The industrial Medical Officer, like his other colleague, needs to become a symbol of help, comfort and security to his patients in time of emergency and sickness, not only in the environment of the factory but the environment of the home of these workers.

Professional prestige must be clearly distinguished from personal regard in which a factory doctor and for the matter of fact any doctor is always held, due to the simple reason of the humanitarian nature of his work. A doctor's professional prestige is his right while personal admiration or regards he obtains by virtue of the display of his professional skill of an increasingly high order. Management must safeguard his professional prestige and make provision that it is upheld by providing the doctor proper professional status. It is essential that he is provided with sufficient authority to enable him to deal effectively with medical problems as they arise. To this end, it is desirable that he should be directly responsible to the Managing Director, Works Manager or other official of comparable status.

(b) Material for his Clinical Knowledge.—

Each industry in the country can provide enough clinical material for a doctor, for the state of health of our workers and the environment of their work is far from ideal, then where is it that management steps in? It can very badly be expressed that management has not done certain important things which are essential to improve the clinical knowledge of the doctor.

(1) The management has not allowed the doctor any time to gain knowledge of factory processes (the flow-sheet of industry) or the nature of work of the worker, the raw materials he handles, etc.

(2) They have not allowed the doctor time and facility to study the working environments.

(3) They have not allowed the doctor necessary clinical assistance for the practice of his clinical work. This has resulted in the doctor getting only a limited knowledge of the employees who are his patients. He is thus debarred from learning the social, mental as well as physical ailments of his patients.

(4) The average mill or factory doctor has about 150 to 200 cases daily to look after. There is a rush of patients and it is humanly impossible for the doctor to have detailed examination of the patient. While it is desirable that a junior doctor should be appointed in such places, management has ignored this aspect of efficient medical service.

(5) Quite often the factory doctor has more cases from the factory staff and their families to attend to and these are attended both in and out of factory hours.

(6) Management has not encouraged factory Medical Officers to form a group for the purpose of scientific study, social intercourse and mutual help, which objects could be attained by such a group by holding meetings at which papers could be read and discussed.

(7) Management has not provided the factory doctor with funds to establish a medical library and receive medical journals to improve his knowledge.

These problems of the Industrial Medical Officer are a poser to the management and it is the function of the management to provide those essential facilities which will increase the clinical knowledge of the doctor and give him the status required to enable him to play his part successfully in the increase of industrial efficiency of the workers.

HEALTH AND ENVIRONMENT

by

Our Study Circle

This is the fifth of the series. We commend to our readers to have the patience to go through the resolutions of the Government of India on the subject and to convince themselves that the Government of the country were not at all serious to remove the environmental causes, which were responsible for the dissemination of diseases among the masses.

It would be clear that these resolutions were more intended to convey to the outside world, particularly the British public, the deep concern of the Government on the health of the Indians than to effect positive improvements in this country! 'The proof of the pudding lies in the eating of it,' they say. The results of the labours of Government bear out our contention. The most regrettable fact is that even after we have attained freedom, the popular ministers, who are supposed to be interested in the health of the nation, follow the same technique, which the foreigners adopted in this country.

—Ed. P. H.

Arrangements for training the superior sanitary staff are now engaging the attention of the Government of India. The chief difficulty at present is to provide courses in practical hygiene and in the study of the bacteriology and etiology of tropical diseases. It is hoped in the near future to make arrangements in India for the former and to utilise the schools of tropical medicine at Calcutta and elsewhere for the latter. Meanwhile, a British diploma in public health is required from candidates for the post of deputy sanitary commissioners and health officers of the first-class. The problems of public health in India are vitally complicated by the fact that biting insects are a prominent factor in the

dissemination of disease, and it is obviously desirable to provide in India, as soon as possible, a complete course of training for sanitary officers.

Training classes for sanitary inspectors are now held in all the more important provinces.

A substantial beginning has thus been made for the development of a department of public health and Indians have been freely enlisted for it. The posts of deputy sanitary commissioner and health officer are now open to Indians. Nine deputy sanitary commissioners out of 26 and the majority of health officers are Indians. The new bacteriological department consisting of 28 officers is also open to duly qualified Indians.

As health officers and sanitary engineers gradually relieve deputy sanitary commissioners of much of the drudgery of inspection and routine work, it is hoped that the latter will be set free to deal with epidemics and communicable diseases from a higher plane, and to consider issues of public health wider than those which they are able to review to-day. It is, therefore, important to provide in advance free interchange between them, the laboratory workers and those carrying out practical research in the field.

Research.—Research is slowly lifting the veil which hides the secrets of disease and mortality and opening up fields of inquiry scarcely thought of a generation ago. The discovery by Sir Ronald Ross of the part played by the mosquito in the communication of malaria and the appointment of the Plague Commission in 1898 are landmarks in the history of Indian Sanitation. In 1902, a research institute was founded at Guindy in Madras, named the King Institute after Lieutenant-Colonel King, C.I.E., I.M.S., in view of his devoted efforts in the cause of sanitation in that presidency. In 1905, Lord Curzon's Government summed up the position and the policy of the Government of India in regard to the establishment of laboratories for the study of problems of public health in India. The functions of the central laboratory were original research, the preparation of curative sera and the training of scientific workers. The functions of the provincial laboratories were diagnosis and special research connected with local conditions. This policy has been steadily developed. The Central Research Institute has been established at Kasauli. The Plague Research Laboratory at Parel has been extended and re-equipped and is now the bacteriological laboratory for the Bombay Presidency; and a proposal is under consideration to attach to it a school of tropical medicine. A research laboratory and school of tropical medicine are under construction at Calcutta. Pasteur institutes exist at Kasauli

and Coonoor. A third is about to be established in Burma, and it is under discussion to establish others in Assam (where it will be combined with a research laboratory) and Bombay.

Besides the routine work connected with the bacteriological diagnosis of disease, antirabic treatment, the manufacture of various vaccines and sera and general research, these laboratories at different times have been the centres of many special investigations, notable amongst which are those on plague and enteric fever. It is hoped that before long each province in India will have a laboratory fully equipped for research.

Indian Research Fund Association.—The foundation of the Indian Research Fund Association in 1911 has marked an important era in sanitary progress. The control and management of the association are vested in a governing body, the president of which is the Member in charge of the Education Department of the Government of India. The governing body is assisted by a "scientific advisory board" of which not less than three members have seats on the governing body. They examine all proposals for work in connection with the scientific objects of the association and report as to their importance and feasibility. The members of this board are appointed for one year, but are eligible for re-election, and they have power to add to their number. The present members are the Director-General, Indian Medical Service, the Sanitary Commissioner with the Government of India, the Director of the Central Research Institute at Kasauli, the Officer-in-charge of the Central Malarial Bureau and the Assistant Director-General, Indian Medical Service (Sanitary): Sir Ronald Ross has been elected an honorary consulting member. The membership of the Indian Research Fund Association is open to non-officials. Every donor of Rs. 5,000 is entitled to become a permanent member, while every subscriber of Rs. 100 per annum can be a

temporary member. Members of the association are entitled to attend and take part in the annual general meeting of the association and to receive copies of the reports and other publications issued from time to time by the association. Although, so far, the fund has been financed solely by the Government of India, it is hoped that in time Indian philanthropists will contribute towards the expansion of the association by founding chairs of research, by financing experimental research measures and otherwise.

The association has been active and can already point to some achievement. Out of an income of Rs. 15 lakhs (£100,000) received since its incorporation and up to the end of 1913-14, an expenditure of over Rs. 14 lakhs (£93,333) has been sanctioned. In 1911, Major S. P. James, I.M.S., was deputed to study yellow fever in its endemic area and to draw up proposals for protecting India against the introduction of the disease. Those proposals are still under consideration. In the meanwhile, stegomyia surveys have been carried out in Calcutta, Bombay, Madras, Karachi and Rangoon and other seaports. Anti-malaria schemes based on preliminary surveys have been carried out at a cost of Rs. 6,02,000 (£40,133). Investigations are at present in progress into the problems connected with the prevalence of cholera, kala-azar, dysentery, leprosy and goitre, as well as inquiries into the pharmacology of cinchona derivatives, the use of hydrocyanic acid gas as a pulicide and the fixation of chemical standards of purity for milk and milk products. Other investigations are under consideration regarding bacteriological standards of purity for water-supplies, the different anti-cholera vaccines and sera, the methods of water filtration and silt removal best suited to Indian conditions, and the etiology of diabetes and the fevers of short duration. These will be started so soon as more trained research workers are available. It is hoped also to carry out, during the next non-epidemic season, an

experiment in plague prevention on a large scale on the lines indicated on page 228.

Besides financing the investigations conducted by its own staff, the association gives grants-in-aid to outside research on approved lines. The co-operation of other workers has been sought, and every encouragement has been given to them. Grants for research have been made, for instance, to Professor MacMahon, Dr. Hossack and Mr. Howlett. The services of Indians have also been enlisted. Dr. Korke is engaged in an important investigation into kala-azar, while Mr. Awati, a medical entomologist, is employed under the association. The Government of India cordially approve the policy of encouraging private enterprise in the cause of research.

The association has also started a journal for the publication of medical research work done in India—the "Indian Journal of Medical Research"—published quarterly. The favourable reception which has been accorded to the first three numbers is evidence of the increased interest that is being taken in sanitary science in India to-day.

The investigations enumerated above represent the work directly under the supervision of the Government of India. The local Governments also are fully alive to the importance of research, and in seven provinces nine special officers are at present engaged in investigating the causes underlying the local prevalence of malaria and devising suitable schemes for the mitigation of that disease.

Malaria.—It remains to consider the results of research as applied to the chief tropical diseases, always remembering that they are liable to revision or modification in the light of further investigation and discoveries. The most important tropical disease is malaria. After allowance has been made for the tendency to attribute to fever deaths from other causes, malaria stands out as universally prevalent in India and in many

tracts is a scourge far greater than either plague or cholera. It maims as well as kills and causes more sickness, misery and death than any other single disease. Measures for the prevention of malaria aim at breaking the cycle of infection in two ways, (a) by attacks on the parasites in man, and (b) by the destruction of mosquitoes. To the former class belong the different systems of quinine prophylaxis and treatment; and to the latter, all those measures which aim at abolishing mosquito breeding grounds. Both methods have been successful in other countries and both have been tried extensively in India. The following propositions represent the experience gained up to date:—

(1) The conditions and causes underlying the prevalence of malaria vary greatly in different places, and no one anti-malarial measure is suitable for all.

(2) Quinine both as a prophylactic and curative agent is of great value to the individual. Its powers of saving life, alleviating sickness and destroying sources of infection cannot be over-estimated. There should be no relaxation in the efforts to educate the people in the use of the drug: and its sale by shop-keepers in rural areas might well be encouraged.

(3) The regular administration of quinine to children in schools during the malarial season is a practical measure of easy application and of proved utility: it is valuable alike for its immediate good effects on the health of the scholars and as a means of spreading knowledge of the use of quinine.

(4) In any community under control quinine prophylaxis properly carried out is a valuable weapon in the fight against malaria: in India, with its free population, the ignorance and apathy of the masses, their prejudice against the drug, their objection to medicine when not actually suffering from illness, and the fact that it must be

continued over an indefinite number of years, greatly limit the value of quinine prophylaxis.

(5) In anti-larval operations it is not necessary to abolish all breeding grounds of mosquitoes, even of known carriers of malarial infection: a marked amelioration in health conditions will ensue if the chief breeding grounds of the malaria-carrying mosquitoes are cleared.

(6) Malaria surveys have brought to light important and unexpected facts regarding the causation of malaria in particular localities. For instance, the enquiries of Major Liston and Dr. Bentley in Bombay disclosed the fact that malaria did not arise from the swampy surroundings of the city and that the malaria-carrying mosquito was *N. stephensi* which bred in the numerous wells attached to private houses. Again, Major Christophers has demonstrated that malaria in the Andamans is due to a species of mosquito *M. Ludlowi* which breeds in the brackish water of the creeks and that the mosquitoes infesting the rice-fields in the neighbourhood are innocuous.

(7) Notwithstanding the initial expense, those anti-malarial measures should be chosen which will act automatically, be independent of outside help and permanent in their effects: those which require regular repetition, constant attention or active co-operation on the part of the people, are under present conditions, seldom durably effective.

(8) The treatment of permanent collections of water is important whether it be effected by (a) water tidiness, through sloping of banks and clearing of weeds, or (b) stocking with fish of proved utility as mosquito destroyers, or by both methods.

The Government of India have arranged classes for instruction in practical malaria work

twice a year. The course is so planned that each member of the class takes an actual part in the preparation of a malaria survey which will eventually be the basis of a practical scheme of malaria prevention. Already 155 medical officers in civil and military employ have passed through the classes. It is hoped before long to spread a large number of trained and active workers over the whole of India.

The Lucknow Sanitary Conference recommended that a malariologist and engineer should be deputed to Italy to study the methods of "colmata" and "bonificazione" under the auspices of the Indian Research Fund Association, and it is hoped to arrange for their deputation. The effect of silt deposit on the malarial conditions of deltaic areas in India is also receiving attention; and interesting experiments are being conducted by the Government of Bengal at Berhampur. Experiments in clearing jungle and undergrowth will shortly be undertaken.

Plague.—The Plague Research Commission, which was constituted in 1905 and is still continuing its investigations, has thrown much light on the etiology and epidemiology of the disease. The chief conclusions that have been reached so far may be summarised as follows:—

(1) In India, where the pneumonic form of the disease is relatively rare, plague is essentially a disease of rats communicable to man and a few of the lower animals; an epidemic amongst men is directly dependent upon an epizootic amongst rats.

(2) Plague spreads from rat to rat and from rat to man through the agency of the rat-flea.

(3) The plague bacillus under natural conditions does not long retain its vitality outside the body of the rat, the rat-flea, or man.

(4) Plague has a definite seasonal prevalence, generally constant for any given place but varying in different parts of India; investigation shows that the plague season coincides with the season of maximum prevalence of rat-fleas.

(5) Infection is carried from place to place only over very short distances by the spontaneous movements of rats: in other cases, infection is carried either (a) by the agency of man or personal effects acting as a means of transport for infected fleas, or (b) by means of merchandise, chiefly grain, which may contain rats as well as fleas. It is not yet established which of these two agencies is the more important, but recent work, both in India and the Far East, has emphasised the importance of grain as a vehicle for the transmission of infection.

(6) In comparatively few places in India does plague infection survive the adverse conditions of the non-epidemic season: such places are usually either (a) large towns, or (b) places which have been infected late in the epidemic season.

(7) In places which have suffered from repeated and severe epidemics of plague, the rats have become less susceptible to plague than are the rats in places which have remained plague-free or have suffered but slightly.

These conclusions have been arrived at after much careful and painstaking research and constitute a great advance on the knowledge of plague, which was available when, in 1896, it first appeared in Bombay. They point, apparently, to a simple solution of the plague problem—no rats, no plague. But this solution is not attainable unless the population concerned is convinced of the danger of living in close association with the rat and is ready to co-operate in its extermination. Unfortunately, attempts at rat destruction by trapping or poison frequently

meet with active opposition. Experience in India, suggests that owing to the excessive fecundity of the animals, general rat destruction, even when applied to extensive areas, gives only a temporary reduction of rat infestation and has a limited sphere of usefulness as an antiplague measure.

In one direction, however, well directed efforts at rat destruction may prove useful. In each epidemic a number of places are infected late in the season and in certain of these plague survives the non-epidemic period only to break out in a virulent form when the conditions of spread again become more favourable. These localities are potential foci of extensive infection. It would seem important to concentrate the energies of the plague preventive staff on them in well organised schemes of rat destruction carried out during the quiescent period before the commencement of the next epidemic season.

Much can be done, indirectly, to reduce the number of rats in towns and villages, by diminishing their food supply. In any place the number of rats is in proportion to the quantity of food which they can obtain. Efficient scavenging and the protection of food-stuffs from the depredations of rats are important from this point of view. The markets, grain stores, and shops in most parts of India, are so placed and constructed as to give food and shelter to large numbers of rats. Experiments are being carried out with a view to discovering the best practical means of disinfecting grain stores and godowns. It is not practicable at present to remove grain markets and godowns outside towns, to prevent them from being used as dwellings for men, to insist on solid masonry buildings, or to prohibit the stabling of horses and cattle in the precincts of dwelling houses. But these measures and the storage of grain in bulk instead of in bags may, with the progress of education, hereafter enter the zone of practicability. The exclu-

sion of rats from houses is important. In several provinces experiments with different types of so-called rat-proof houses have been made with varying degrees of success. The results suggest that no form of house could remain rat-free for long in India owing to the habits of the people. Even were this not the case it would obviously be impracticable, for financial reasons to render dwelling houses in the towns and villages of India rat-proof on anything like a large scale. On the other hand, the individual can protect himself by providing his house with masonry floors and walls and windows enough to give ample light and air to every room and by preventing accumulations of rubbish amongst which rats can build their nests. The rat requires shelter for breeding, is mainly nocturnal in its habits and prefers darkness to light.

Three other measures remain to be considered—evacuation, disinfection and inoculation. The evacuation of all houses in large towns, on the occurrence of rat mortality therein or human plague cases in adjacent dwellings, is rarely possible, but in villages and parts of smaller towns, it is a valuable means of checking an epidemic of plague. Disinfection to be efficacious should be directed against the rat and the rat-flea. It is of little value when it leaves both untouched. The practical objections to compulsory inoculations with anti-plague vaccine on a large scale continue; but the safety and efficiency of inoculation as a personal preventive measure against infection has been abundantly proved, and in certain areas the prejudice against it appears to be diminishing. The Government of India desire that every facility should be afforded to any one wishing to obtain this protection for himself or his family and they commend to local Governments the employment of carefully selected private practitioners to this end.

(To be continued)

PUBLIC HEALTH FACILITIES IN THE STATE

by

T. M. S. Mani, I.C.S., Secretary, Health Department, Government of Madras.

Various thinkers and planners have indicated that the fundamental needs of man, and therefore the primary objectives of all planning and development, are, useful and appropriate employment, and reasonably good food, clothing and shelter for all. Some add good health to the list. I am reminded of the story of the man who prayed to the Almighty for favours, and when the Deity appeared and promised the grant of just one boon or wish and no more, asked that it should be given to him to look, from the third floor of his house, at his grand-children playing in the compound. The grant of this wish to the clever devotee, ensured to him adequate wealth to own a three-storeyed house, a goodly progeny, and good health, to live long enough and see with unimpaired vision. If I were praying for a boon to-day, I should imitate his excellent example and ask only for good health. For unless your food, shelter and environments are reasonably good, unless you have the clothing suited to your climate, and unless you have congenial and useful employment and thus secure mental peace, you become a prey to one or other of the multitude of diseases which assail man.

But, alas, the days of the intercession of the Almighty and the grant of boons seem to be no more, probably because in the bustle of modern life, we are unable to concentrate in prayer or because we have forgotten how to pray or because our environments and our selfishness preclude a successful attempt. Instead, we demand loudly that the State should provide the various ingredients and facilities which go to make and preserve good health. Thus we ask for proper town-planning and housing, with protected water supply and drainage, but when

these are provided, many choose to live uncleanly, forgetting the effects of their action on their fellow-citizens. We ask that the State should secure for us freedom from disease, insects and germs, but when this is sought to be achieved we ourselves create, through ignorance, carelessness or selfishness, the precise conditions in which insects and germs can thrive and attack man. We ask for food and clothing but when luckily we have these, we gorge ourselves with the wrong kind of food and wear the wrong clothes, and get uncomfortable and ill. The fact is, man sometimes does his best to live unwisely, but clamours for relief from disease and physical suffering, often brought, on himself and others as well, by his own folly.

The State does not therefore leave man to his own devices but does its best to provide all the requisite facilities for good health and living, to the extent it finds possible, with the resources made available to it by the people themselves. It seeks to educate the citizens to live cleanly and healthily with the facilities and amenities so provided. It also enforces, in the interests of the entire community, the maintenance of clean and sanitary conditions of living. Now what are the facilities the Government and other public bodies provide and enforce in our State? The State acts on the sound principle that prevention is better than cure, and when prevention has not proved effective, as is sometimes the case, it provides medical relief to overcome disease, infirmity and suffering. I propose to refer briefly this evening to the public health facilities provided. Curative facilities are quite another story.

Probably the most essential preventive measure, in our conditions, is protected water-supply

and drainage. Government have planned to provide every municipal area with protected water supply and drainage in a period of 20 years and are actually implementing a programme under which, about 60 specific schemes in 45 municipalities will be executed, in order of priority of need, during the first five years, commencing with the current year. Municipalities, which are responsible for the provision of these amenities, cannot in present conditions, find all the funds required for the programme. The State therefore expects them to meet only as much of the cost as they can, from accumulations in their water-supply and drainage funds and by means of taxation up to a reasonable limit, to finance loans. The entire balance, even if it exceeds half the cost, the limit of State assistance hitherto, will be met by the Government. The total cost to the Government under the first five-year programme is expected to be over 2 crores of rupees. There are, however, difficulties in implementing this programme, on account of the lack of the requisite cast iron pipes and other materials, and skilled technical personnel. The Government have arranged to purchase a reserve stock of pipes and fittings for these schemes to the tune of 38 lakhs of rupees, and would have secured further supplies from abroad, but for the inability of the Central Government, in present conditions, to give them even loans to finance such purchase. It is hoped that conditions will soon improve and enable Government to complete the programme according to schedule. In the matter of water supply in the rural areas, however, we have been more fortunate. A specially accelerated programme of work is in progress, financial from a special fund of a crore of rupees, to which a sum of 15 lakhs of rupees is added every year. Before long, rural areas which are badly in need of drinking water will be provided with supplies.

Lack of finance and technical personnel is also standing in the way of the implementation of

desirable Town-planning schemes. But every effort is being made to have schemes prepared and executed to the extent the limited resources available permit. Constructions and alterations of buildings are carefully regulated by local bodies, under general State control in accordance with a salutary set of building rules, to secure the best health conditions possible. For instance, no building is allowed to be put up near another, unless sufficient space is left, in between, for light and ventilation. No dangerous or offensive trade or manufacture is allowed in a residential area. Everything is to have its proper place, but success in such measures will be complete only if each member of the public is unselfish, and places the common good, above advantage to the individual.

A very important item of preventive work which the Government have been concentrating on is the eradication of common diseases like malaria, filariasis, cholera, small-pox and plague which occur in epidemic or endemic form and take a heavy toll of lives. Scores of comprehensive anti-malaria and anti-filaria schemes, using modern equipment and chemicals, are now in operation, some with the active assistance and co-operation of the World Health Organisation. The cost of these schemes to the State Exchequer in the current year, in addition to what local bodies are spending, will be over 13 lakhs of rupees. Vaccinations and inoculations are carried out everywhere to protect the population from the common scourges like cholera, small-pox, plague and enteric. A noteworthy arrangement, recently introduced, is to concentrate on this work well in advance of epidemics, the occurrence of which is intelligently anticipated in the light of past experience, and with reference to seasonal and other conditions. This campaign against disease, and particularly epidemics, is backed by routine action designed to secure efficient sanitation and proper conservancy, executed by local bodies under the supervision of health officers

under the ultimate control of the Government. Inspection of lodging and eating houses and the sale of food generally, are among the measures taken to maintain public health. Admittedly, the Government and local bodies are not in a position, in present conditions, to secure and employ adequate numbers of trained public health personnel of all grades, but they are making the fullest possible use of the resources available to them in men and money.

But, how many of us are actively conscious of even the routine measures employed and assist in them? I am referring to the usual removal of filth and rubbish, the proper cleaning of premises and streets, the improvement of dirty and insanitary surroundings, and preventive vaccination and inoculation, especially in advance of epidemics which we know to be likely. The average citizen does not, unfortunately bother, about these things and treats them as though it is none of his business. A senior and experienced health official was telling me the other day that when health staff make visits in advance of a threatened epidemic few people get themselves inoculated but once actual attacks occur and particularly if they are among those not protected, the people readily get themselves done. In the meantime, damage has been done, and public health in the area endangered. With a little forethought and co-operation from the public, the epidemic might possibly have been prevented altogether, or at least kept in strict check. If every citizen keeps his surroundings clean with the help of the sanitary staff and protects himself as advised, there is bound to be a marked improvement in health of the people. Indications are, however, not wanting that he is getting increasingly health conscious and feels it is his duty to help. In the meantime, the Government and local bodies do not hesitate to use coercive measures, where required, for the good of the people as a whole, and as a result, the death rate is gradually declining.

For a mother to give birth to a healthy baby and to survive the ordeal is an achievement which every modern State wishes to secure, with the minimum of failures. Without healthy mothers and healthy off-spring, there can be no strong and healthy nation capable of defending itself and contributing to its own happiness. Maternity and child welfare have therefore figured very prominently among the activities of the Government and local bodies. Advice and guidance during the pre-natal stage, as well as post-natal care, are provided in the 452 maternity and child welfare Centres in this State, which employ 99 women medical officers and 814 midwives. The numbers of centres, women medical officers and midwives are constantly being sought to be increased, with the co-operation of local bodies and the assistance of Government grants ranging from a fourth to one half of the cost. The total amount of such grants made by the Government in the current year is about Rs. 2,04,423. It is gratifying that parents have found the centres most useful and mothers flock to them. The number of confinements attended to by these centres in 1947, 91,748 and in 1948, 1,13,762. Infant mortality which used to be over 200 per thousand live-births in the past, was only 128 in 1948. 61 new maternity and child welfare centres were opened in the current year.

What is the sanction behind all these health measures one may ask? The answer is that in this State we have a comprehensive Public Health Act, backed by provisions in the Local Boards and Municipalities Acts, which provides for practically every possible contingency. These provisions enjoin specific duties and responsibilities on every citizen and local authority and empower the appropriate categories of the health staffs to enforce salutary and accepted regulations and practice, in order to preserve and improve the health of the people. Madras is proud of the fact that it was the first State to

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AMERICAN CITIZENS' VIEW ON BCG

We publish hereunder Bulletin No. 437, issued by the Citizens' Medical Reference Bureau, Inc. It gives the view of those who should be directly interested in the children of the soil.

When BCG campaign was first started in this country, we struck a note of caution that the campaign was more intended to collect statistical data to prove or disprove the efficacy of BCG vaccination than to immunise our nation. The more the facts come to light, the more we are convinced that the ulterior motive for the campaign in this country is to use the people of this country as human guineapigs. It is most unfortunate that there is no public opinion in this country, nor have our so-called representatives in our Parliament taken the trouble to study the subject. They have so far, gulped down their throats what the Ministry of Health, Government of India, told them on the floor of the House.

This is how in our young democracy, so vital a subject as the health of the nation, is being looked after by the so-called representatives of the people. It looks gloomy whether in this scorched earth, democratic institutions can grow at all, judged from the trend of events relating to the health of the nation.

—Ed., P.H.

The more centralized Medical Practice becomes, the more free the Public Health Service would feel to experiment upon workmen as it is now doing with the millions of children in war-torn Countries.

The employees of the nation who are now being solicited to lend their support to a nation-wide system of compulsory health insurance will do well to note the extent to which the fifteen million children in war-torn countries are now being used in a gigantic medical experiment with BCG vaccine and whether or not they wish to allow medical practice in this country to

become so centralized that they and their families will be subjected to similar medical experimentation.

No Indication that Health Service Opposed BCG Experiment

As the United States has contributed more generously to the activities of the United Nations International Children's Emergency Fund than any other country the Public Health Service was in a strategic position to advise against the carrying out of the BCG vaccination program for the alleged prevention of tuberculosis.

But there is no indication that the Public Health Service went out of its way to point out that the program had never proved acceptable to health authorities in the United States or to present other evidence why the children in war-torn countries should not be used in a gigantic medical experiment of this kind.

On the other hand, it is clear from an article by Carroll E. Palmer, M.D., in *Public Health Reports*, October 7, 1949, that the Public Health Service welcomes the BCG vaccination program in European countries as "offering a tremendous facility for medical research."

Warns that BCG Vaccine Must Not Be Considered a Virus Fixé

That there is a possibility of BCG vaccination actually causing tuberculosis is indicated from an article by E. M. Medlar, M.D., Sunmount, N.Y., published in *The Journal of the American Medical Association*, October 29, 1949, p. 593.

Doctor Medlar states that "Through the offices of the World Health Organization the Government of various countries have been solicited to sanction prophylactic vaccination against tuberculosis, through the use of BCG vaccine, of 15,000,000 children and young adults who are non-reactors to tuberculin." He further states that "In the United States and Canada pressure is being exerted in various sections to increase the use of this vaccine in an effort to control tuberculosis." Doctor Medlar then presents a lengthy discussion of BCG vaccination in which he takes the position that an effective control of tuberculosis cannot be obtained without a major attack on the source from which the disease is spread and that the program of mass vaccination with BCG does not touch that problem.

The warning sounded by Doctor Medlar that BCG vaccine must not be considered as a virus fixé is especially significant. He says, "The safeguards now in effect in the preparation and use of BCG vaccine are to be highly commended; however, it is essential to keep in mind that this relatively nonpathogenic strain had its origin from a highly pathogenic bovine type of tubercle bacillus and that, until such time as the factors governing the pathogenicity of tubercle bacilli are known, BCG vaccine must not be considered as a virus fixé."

No Proof of Effectiveness of BCG Vaccination

According to Carroll E. Palmer, M.D., in *Public Health Reports*, October 7, 1949, "strict scientific proof of the effectiveness of BCG vaccination in the control of human tuberculosis is not available." Doctor Palmer says:

"First, it must be admitted in clear and unequivocal terms that strict scientific proof of the effectiveness of BCG vaccination in the control of human tuberculosis is not available. This is true despite the fact that millions of persons have been given BCG during the past 20 years and despite the very suggestive evidence of a few, small scale studies."

Proposes Using Fifteen Million Children for Wide Variety of Experiments

"Prospectus of Research in Mass BCG Vaccination" is the title of the article in *Public Health Reports*, October 7, 1949, the opening paragraph of which reads as follows:

"The anti-tuberculosis mass vaccination program of the Joint Enterprise offers and almost unparalleled opportunity to study tuberculosis on a world-wide basis. At various times during the planning of the program, suggestions have been made to take full advantage of this opportunity, and at present a beginning has been made in this direction. In general, however, emphasis has been laid primarily on a relatively few statistical studies. To limit the program to such studies is to neglect the chance to make major contributions to the whole broad field of tuberculosis. The tuberculin testing and vaccination program should be viewed as offering a tremendous facility for medical research."

The following extracts from the article by Doctor Palmer are highly significant as showing that experiments are recommended to determine the product to be used for making the tuberculin test; what persons should be selected for vaccination; what vaccine to use and what the reactions to the vaccine are for the different vaccines that are used and the effects of revaccination:

"One of the most pressing problems that require further study in connection with the practical aspects

of the Joint Enterprise program concerns criteria for selecting persons for vaccination. At the present time several different products are being used, by several different methods and combinations of methods. Also, the rules have recently been changed to use 10 rather than 33 or 100 TE for the final Mantoux test. There is in practice considerable variation in the way all of this is being carried out. It should be admitted furthermore, that there is not general agreement on just what degree of tuberculin sensitivity should be used to separate persons into those needing and those not needing vaccination. In addition, it is not known whether the criteria for selecting persons for vaccination should be varied with age, tuberculinization of the population, country or nationality groups. Lack of uniformity in this part of the work makes it very difficult to obtain full use of the statistical tabulations being prepared. For these reasons it is essential, at once, to undertake certain studies which may be expected to furnish more conclusive evidence regarding precise as well as practical methods for managing the pre-vaccination testing.

"In order to get information on this problem a number of separate projects should be undertaken. All of them, however, involve very difficult, fundamental studies on the specificity of the tuberculin test but much information of practical value may be obtained if arrangements can be made in the routine service program for doing duplicate tests, using different tuberculin products and different methods of application.

"Vaccination programs for tuberculosis in some parts of the world are not likely to be successful until a

preserved vaccine is developed which is satisfactory in producing a high level of allergy and which causes relatively few complications from the vaccination. A number of preserved BCG and other products are available for trial now, and others are being developed. Further, there is at this time considerable disagreement on the adequacy of different BCG vaccines, and as well on methods of giving the vaccine. One of the most urgent parts of the research program for the Joint Enterprise, therefore, should be to set up studies to determine the allergy producing qualities of different vaccines, both fresh and preserved, on the different methods of giving the vaccines; and on complications of the vaccination reactions.

* * * * *

"The importance of obtaining information on questions of revaccination, especially in connection with future work by the Joint Enterprise and by local tuberculosis control programs during the next few years, makes it undesirable to wait for the results of the first projects before undertaking certain others.

"First, a relatively small scale, very intensive study should be done at once to obtain details of the effects of revaccination on allergy. The critical aspects of the project involve standard testing and vaccination, followed in 6-8 weeks by revaccination of all who have not attained a high degree of allergy, with a repetition of the revaccination again in 6-8 weeks for those who still are not highly allergic. The results of this project should furnish details on the relationship between repeated vaccinations and attained allergy, the dangers and complications of revaccination, the percentage of individuals who repeatedly do not develop allergy."

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PUBLIC HEALTH FACILITIES IN THE STATE

place such a comprehensive measure on the Statute Book. The working of the Act so far is being carefully reviewed and it will be amended or added to, to the extent necessary to secure a further improvement in Public Health.

The magnitude of the task involved and the facilities provided may be gauged from the fact that, in addition to expenditure by local bodies from their own revenues, the State Govern-

ment will be spending as much as 120 lakhs of rupees on this account in the current year.

This State is probably second to none in India in the matter of public health facilities but they are being constantly improved and enlarged. A good deal has been achieved but a lot more remains to be done, with the co-operation of the people.

—Courtesy : AIR Madras.

PHYSIOLOGICAL ASPECTS OF BETTER HOUSING

by

Heinz Specht, Ph. D. and Paul A. Neal,* M. D.

The constitution of the World Health Organization states: "Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity."

It is generally accepted that there is a relationship between housing and disease. A causal relationship can be shown to exist between specific diseases and poor housing with unsafe water supplies and sewage-disposal facilities. Both public and private housing are involved, although the most impressive findings have naturally been made in multiple housing of the "tenement" type. However, the co-existence of a low level of public health and bad housing conditions does not necessarily prove that the former is caused by the latter. It may be said without serious reservation that factual data do not exist that demonstrate the exact effects of good or bad housing *per se* on the incidence and course of illness of the occupants, since poor housing has not been separated from other attributes of poverty, such as malnutrition and lack of medical care.

Therefore, since no precise quantitative measurements have been made on the relationship of a disease to housing, the question is, "Can studies of the physiological aspects of the hygiene of housing be expected to give precise information on the physical well-being of the occupants?" A general analysis of the problems may clarify the present position which this field of research occupies.

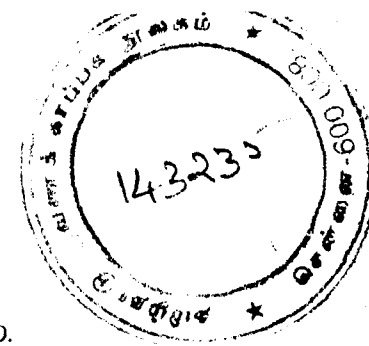
Physiology is the science which deals with the functions of the living organism and its parts.

Hygiene is the science of health and its preservation. Thus, the physiological approach to these problems involves the study of the range of human functions which are affected by housing as contrasted to the usual approach which involves the study of the relationship of a disease entity to housing. The integrated details of such physiological approaches include consideration of comfort and morale.

Adaptability and Environment

The adaptability of the several functions of the body to the environment, as housing limits such an environment, varies from one individual to another. The range of such adaptability is greatest in health and proportionately limited by various illnesses. For example, the lower limit of temperature to which the clothed body can adapt itself by increasing its metabolism without shivering is lower in health than in illness. Consequently, the imposition of a temperature lower than such a limit presents a tax on the resources of the body which is especially heavy in illness. The attention of medical science has long been directed to the necessity for observing a rather narrow temperature range in the treatment of disease, but the desirability of considering the effect of temperature on well-being has only recently been advanced. We have intentionally separated illness from well-being and comfort, but there is no proof that violation of the latter does not constitute an introduction to the former. Thus, well-being and comfort cannot be considered wholly as luxuries.

* Laboratory of Physical Biology, Experimental Biology and Medicine Institute, National Institutes of Health, Bethesda 14, Md. Presented at the orientation course in the Hygiene of Housing, Training Division of the Communicable Disease Center, Atlanta, Ga., May 3, 1949.



If housing were to be considered in connection with production, the problem could be quantitatively attacked by measurements of efficiency. There has been developed recently an appreciation of the necessity of more accurately designing all types of machinery and equipment for use by human beings around the skills, abilities, and physiological requirements of the human being. In an attempt to utilize this contribution to engineering development and design, it immediately becomes evident that even the more simple and common physiological aspects of the human being are not well enough known statistically to serve as a design basis. Consequently, the new field of human engineering undertakes to provide the essential elements on which to base intelligent design. In the problem of housing, the need for human engineering extends over a wide range of physiological characteristics.

The definitive limits of the various environmental factors affected by housing should determine the steps to be taken in designing and constructing houses from the human point of view. There would be no difficulty in convincing anyone of the necessity for full consideration of physiology in housing, if the situation were as acute and fraught with danger as, for instance, the biodynamic design of the cockpits in airplanes is on the successful operation of our newer aircraft. However, a 6-foot woman working over a 2½-foot kitchen sink is acutely aware of discomfort. The continuing character of these seemingly minor aspects of housing lends considerable weight to their effectiveness in causing poor physiological conditions as well as home accidents.

The Physiological Approach

The physiological approach to criteria of adequate housing must be based on the study of various human functions as they are affected by the environment which houses may provide.

We may begin by investigating such a fundamental function as body temperature maintenance in the face of various air temperatures, radiant heat levels, air humidity levels, and ventilation velocities. This is an active field of investigation in which good methods were evolved during World War II for judgment of extreme conditions, as in arctic and tropical environments. Judgments are based on tolerance for various periods of time, and also, within the limits of tolerance, on comfort and perception of change. In the maintenance of body temperature the tax on the metabolism in cool environments is assessable through measurement of oxygen consumption. The criterion for what limits may be allowable, where they do not entail appreciable discomfort, may be set by economic considerations of caloric diet versus central heating.

Of public interest are studies on the effects of sudden change in environmental temperature such as result from leaving and entering air conditioned buildings and the associated problem of the effects of spending part of one's time at one temperature level and part at another. Such conditions exist now for a great many people employed in large office buildings and manufacturing plants as well as theatres and stores. Basic physiological information will have to be obtained under controlled conditions in order to analyze these problems.

On the other hand, the maintenance of body temperature in warm environments taxes the heart and circulation. The circulatory regulation is the principal physiological factor in ridding the body of its metabolic heat via radiation, convection, and evaporation. What limit to set on cardiac work short of an acute sense of discomfort requires inquiry into the chronic effects of increased cardiac work on general fatigue. In cardiac conditions added stress certainly produces abnormally adverse effects. The importance of proper home environment for adequate

sleep cannot be over emphasized in the management of persons with physiological impairment. Diverse small stresses are additive and may thus constitute the deciding factor between physiological adaptation and dysfunctions ranging to death. Current interest in heart function is setting the pace for thoroughgoing methods of research in this field.

Ventilation

The matter of ventilation is difficult to assess, but one may use functional attributes of the body as critical factors which demand certain levels of ventilation beyond those involved in temperature regulation. Take, for example, the basic matter of odors. To insist on ventilation in a house which will eliminate warning odors and smokes is at cross purposes to safety, as well as undesirable from the point of view of air motion and heat economy. It is of prime importance that proper local ventilation in cooking be provided, and it is also desirable to make provision for adequate general ventilation to reduce other odors to undetectable levels. What these adequate levels are can only be determined by studies in the detection of, and adaption to, odors by the human olfactory organs. The study of odor perception and the quantitative chemical or physical estimation of odorous substances in the air is still in a rudimentary state, mainly through the lack of suitably sensitive and discriminatory devices. It is probable that such studies will progress more successfully now that radioactive labelling of odorous substances is feasible.

The criteria for optimum humidity levels have been set by considerations other than their effect on the efficiency of the respiratory system in protecting against bacterial invasion. Such functions are currently recognized to be markedly susceptible to changes in humidity. In addition, studies in bacterial survival show that rapid decline in viability may be effected in environ-

ments of optimal humidity. Thus, both the incidence of infectious agents and susceptibility to infection may be reduced by proper humidity maintenance.

Air Borne Diseases

A great deal has been published, both in the popular press and in the scientific literature, regarding air-borne diseases and their control through specific physical or chemical devices. Most of the studies were made to test such particular devices. These can only be applied to disease organisms which are suspended in the atmosphere in finely dispersed form, either directly or by resuspension. The part played by this type of infection in the transmission of diseases has yet to be quantitatively established under laboratory conditions. The epidemiological approaches to this question made in the past are indeterminate, because they necessarily involve other modes of disease transmission than by air.

The high incidence of attacks of hay fever and asthma in the general population is principally caused by dusts and pollens. The elimination of dusts and pollens from the house environment will reduce materially the debilities and discomfort produced by such substances. It seems possible that with recent advances, filtration and precipitation of air-borne dusts and pollens is economically feasible at the housing level.

Effects of Defective Illumination

Numerous studies indicate that poor illumination has deleterious effects on efficiency and comfort, and is the cause of a great number of home accidents. Conclusive information on the causal relationship between poor illumination and organic injury of the eye is not available. Current information on the relation between illumination and healthy vision indicates that present lighting standards are based largely on

practical experience as to comfort and to some extent on efficiency. Until adequate physiological principles can be applied to this field there will always be a great diversity in home lighting, which is often not suited to particular home tasks. The problem of what constitutes the proper intensity of illumination should be dictated by the nature of the task, and to some extent by the characteristics of the individual, such as age and correction of visual defects. Many properties of illumination, other than intensity on the work, are of prime importance. These include direction, distribution over the surrounding areas, reflectance of surfaces in the range of vision, and color of light and objects. Both artificial and natural light must be built into houses since illumination affects all our conscious functions. The absence of natural light, while it may be advantageous from an engineering point of view, both thermally and otherwise, is not compatible with either aesthetic or sensible comfort in the opinion of many people. This is evident to real estate dealers who know that natural light in its various aspects such as "sunshine" and "views" is a potent criterion in the free choice of houses and apartments.

Problems arising from Muscular Work

A host of practical problems involve the performance of muscular work. Usually these are well within the physiological range and thus not readily assessed by the usual techniques of oxygen consumption and ergometer measurements. The definitive factors in muscular effort in home activities will lie in the relative convenience or ease of carrying out repetitive acts. The criteria are then not muscular potential but psychomotor relationships which may be critically affected by certain mechanical principles. Thus the cleaning of floors, walls, and furniture, as well as the preparation of meals, can be drud-

gery of the most appalling sort and evoke vociferous complaint. Not all of this is attributable to disinclination for the job, but is in reality due to improper functional arrangement for human performance.

Noise

Industrially, noise is recognized as deleterious to efficient operation. Good engineering practice indicates that noise elimination at the source, isolation by soundproofing, and other methods of noise reduction are demanded from the economic standpoint. The harmful effects of noise are particularly obvious in multiple dwellings where interference with proper rest is probably the primary consideration. Thus methods of sound control and the establishment of suitable levels of sound intensity are problems which must be dealt with on an experimental basis.

A Plea for Coordination

The various approaches discussed above have been made in an uncoordinated fashion as regards their application to housing. The special requirements of houses in providing a physiologically suitable environment for work and rest, and the tremendous numerical need for improved housing require a concerted program of research in which those particular phases which apply to houses can be intensively prosecuted. The great advances in construction of houses and also recent developments in the field of human engineering require that the physiological aspects of better housing be vigorously investigated. The long-range nature of certain aspects of this problem, and the fundamental character of many of the variables which have been discussed call for a continuing program of research. The integration of the necessary disciplines can best be carried out in a laboratory devoted to the study of the physiological aspects of housing.

(Courtesy—P. H. Reports.)

ACCIDENT-PRONENESS: A CRITIQUE

by

E. Richard Weinerman, M.D., M.P.H.

School of Public Health, University of California, Berkeley, Calif.

The concept of "accident-proneness" has been intensively discussed in the modern psycho-analytic literature. Its appearance in a recent editorial in the *American Journal of Public Health*¹ and in a symposium in *Public Health Reports*² calls for critical analysis of the public health implications of this thesis.

As developed by Dunbar, Alexander, Rawson, and others, the concept of "accident-proneness" states that the majority of accidents occur as the result of *subconsciously intended* actions on the part of certain personality types. It is suggested that accidents are caused by deep-seated psychological conflicts in the individual, rather than by physiological or environmental conditions.

Accidents do not just happen

There is little doubt that accidents are only infrequently the result of pure chance. The emphasis given by the psychoanalysts to this point is a contribution of major importance. Accidents represent the interaction between man and his environment, when the condition of one or both of the interacting elements is such as to increase the probability of an untoward result. Assuredly, "accident-prone" individuals exist—but so do environmental safety hazards. It is as foolish to deny the contributory role of the environment as it is to deprecate that of the individual.

All accident-proneness is not psychological

All accident-prone individuals, however, are not necessarily characterized by personality disorders, as implied by the proponents of this

thesis. Individuals who have unusual predilection for injury may reveal a vast number of pertinent *biological conditions*—such as fatigue, transient emotional stress with resultant inattention, impaired vision or hearing, underlying disease, etc. Moreover, the individual cases of carelessness and incompetence that may be psychologically determined, reflect immediate economic, social, or domestic pressures as well as complex psychopathology originating in early life. The first point is, then, that the accident-prone individual is not *always* a repressed or frustrated person who "subconsciously intends" the injury.

Environment plays a basic role

On the other hand, the insistence that most accidents are "caused" by neurotically motivated individuals relegates to a position of minor importance the role of environmental hazards. Accidents do reflect—and in wholesale manner—defects and inadequacies of industrial equipment, of housing, of traffic systems, of play areas, and of many other remediable conditions of daily life. This aspect of the accident problem is investigated in more detail below.

It is, then, the *overemphasis* upon hidden psychological motivation and the resultant minimizing (even when unintentional) of physiological and environmental factors which causes concern with the Dunbar-Alexander theory of accident-proneness. The overemphasis is not merely an inference. Alexander, in fact, states that "most accidents are unconsciously intended"³ The A.P.H.A. editorial summarizes this concept by stating that "the vast majority of accidents . . . are in a subtler sense determined by

underlying trends of human personality."¹ (Italics added, E. R. W.). The entire event is transferred from the real world of persons and things to the disembodied arena of an individual mind.

Implication of the psychoanalytic concept

The dangerous consequence of this thesis is to restrict accident prevention efforts to the appraisal of personality types and the removal of "susceptible" individuals from the potential accident situation. Indeed, Alexander specifically states³ that "the primary measures must be directed toward the person." He further states that since intensive psychoanalysis and psychotherapy would be the only effective means of handling such persons, and since these are impractical as mass measures, "recognition" and "removal" of designated individuals are the only feasible methods of accident prevention.

It is important to reassign workers who have a susceptibility to accidents to less hazardous jobs. This can be done only on the basis of careful records, and these should follow study of accident rates among the replacements. Safeguards must also be set up so that workers are not downgraded or fired under various pretexts related to this concept.

This procedure, however, is applicable only to a limited number of workers. It is by no means clear just how the supposedly accident-prone individuals in our society are to be removed from their involuntary contact with slum housing, icy pavements, drunken drivers, etc.—or even from their contact with difficult occupations in a period of job scarcity. The corollary of a concept that attributes most accidents to subconscious intention on the part of certain individuals is the relaxation of efforts to affect action of industrial managers, automobile manufacturers and used car dealers, city planners, housing authorities, and the like.

This shift of emphasis from environmental hazards to personality factors is fraught with social danger. A grim chapter in the history of the Industrial Revolution is that which deals with the crippling and killing of thousands of workers who were exposed to the unguarded machines, the condemned mine shafts, the ill-lighted sweatshops of the emerging factory system. One of the great social achievements of our time (still far from complete) is that of Workmen's Compensation legislation, which—after intense struggle—has taken the responsibility for occupational injuries off the back of the disabled worker and has placed it on the owner of the plant. Amazing progress in industrial hygiene and safety was stimulated directly by these laws. A reading of Dr. Dunbar's works on "accidentitis" makes one apprehensive lest some employers attempt to alter the current legal protections for the worker by introducing this personality concept as a new reason for the old practice of denying compensation. It would be a giant step backward if an injured worker's compensation were to be denied on the grounds that the accident was due to his "impetuous" and "resentful" personality, rather than to the complex of contributory causes.

Lack of proper evidence for the psychological entity

There is much more that is troublesome in this concept that "most" accidents are the result of unconscious behaviour on the part of certain personality types. Proper scientific evidence for the existence of a specific psychological pattern seems to be lacking. As stated by King⁴:

The finding that a relatively small percentage of the accident group is responsible for a high percentage of the total accidents does not constitute proof of the existence of accident proneness as a clinical entity. It does not identify biological characteristics invariably associated with this special susceptibility nor does it preclude the possibility of a greater exposure of the "accident prone" group to hazardous situations. The test of the hypothesis lies in the success or failure to identify

causal physiological or psychological characteristics, or their combination, present in individuals showing a high frequency of accidents, and absent or present to a lesser degree in "accident free" individuals with a comparable background of experience.

Accidents as the result of multiple factors

A wealth of data is available to show the interdependence of many coexistent factors in the causation of accidents. The epidemiological approach of Gordon⁵ stresses the complexity of factors—seasonal, demographic, genetic, biologic, geographic, etc., as well as psychologic. His conclusions are pertinent to this critique:

That accidents and disease, as they affect groups of people so frequently show similar distributions is no reason to assume identical causes; indeed, the expectation is that they are different. The illustrations presented here were purposely drawn from a wide variety of accidents and diseases, to the end of demonstrating that both great classes of morbid conditions of man are governed by broad biologic laws; that in their action on groups of people they are the resultant of the total forces within a universe, of an ecologic entity A wide range of conditions commonly contributes to the prevalence of an injury.

The time trends and statistical distributions of available accident data seem to support the conclusion that no single type of personality configuration can explain the majority of accidents. The National Safety Council⁶ has reported that non-motor vehicle accidents have declined consistently since the turn of the century, while accidents due to motor vehicles have steadily increased in proportion with the greater number of vehicles in use and with the increasing congestion of traffic ways. Studies of occupational injury⁷ constantly reveal that certain industries (e.g., mining, lumber, construction) have significantly high accident rates. The overall accident rate in industry dropped steadily from 1936 to 1941, but then rose abruptly as conditions of wartime production developed.⁸ This change was attributed to such factors as fewer replacements of parts, crowding of equipment, unsafe

wearing apparel, fatigue, new unskilled workers, and the like. Another report⁶ showed that the rate of occupational injuries increased disproportionately as the length of the working day exceeded the standard of eight hours. A survey by the Travelers' Insurance Company indicated that three-fourths of all cars involved in accidents had serious defects involving headlights, tires, brakes, etc. Britten⁹ has analyzed National Health Survey data to show the inverse relationship between rental value of housing and home accident rates. (This invites attention to the "proneness" of the sub-standard housing environment as far as accidents are concerned.) It is difficult to reconcile the thesis of psychologically determined accident-proneness with such diversified environmental relationships as these studies demonstrate.

This tendency of psychoanalysts to attribute universality to observations made in circumscribed situations is well scored in a recent psychiatric review.¹⁰:

A dominant defect of the Freudian psychoanalytic discipline is to take or mistake a part for the whole, unwarrantedly to assert that a complex or a number of complexes, which may or may not be present, are causative in human behavior.

"Accidentitis" would seem, then, to be a poor resolution for the diverse problems of mine cave-ins, inadequate fire-proofing, impaired and uncorrected vision, etc. Neither submerged guilt complexes nor overly compulsive behavior reactions are sufficient explanation for the high incidence of accidents among workers exhausted by production speedup or among children forced to the streets for play space. The psychoanalytic explanation is inferior to the biologic when the excessive accident rate in the very young and very old is analyzed. One wonders if the studies of truck drivers (which show that a relatively few drivers were responsible for a large proportion of the accidents) carefully examined the distribution of these individuals according to types of routes covered,

amount of night driving, unrelieved hours on the road, etc.—before concluding that personality type (sic) was the decisive factor. Individual case histories—however dramatically presented—are inadequate substitutes for painstaking analysis of accident data, which show accidents to be regularly concentrated in the hazardous occupations, congested roadways, and substandard dwelling places. Is it to be assumed that the so-called accident-prone personality type has an affinity for these particular surroundings?

Conclusions

An accident is the result of undesired and unanticipated—but preconditioned—interaction between the individual and his environment. Psychological motivations undeniably contribute to accidental occurrences. It is, however, essential that we continue to emphasize social control of the hazardous environment, correction of physical and mental impairments, and education for safety. To depend primarily upon detection and removal (or psychoanalysis) of particular personality configurations is neither warranted nor wise in light of the incomplete state of our present knowledge of accident-prone behavior patterns. There is serious need for statistically sound and scientifically convincing data to test the psychoanalytic theory. Until proof of accident-proneness is produced from study of mass accident distributions—and not only from in-

tensive analysis of individual cases—the factors in accident prevention which do have a scientific basis must not be displaced. As in any experimental work, the theory must be subjected to the most rigorous tests before it can be generally accepted. As it is now presented, the "accident-prone" concept leads to defeatism and ultimately to reactionism in such fields as social insurance, industrial hygiene, housing, and city planning.

Successful accident prevention must recognize the total ecologic complex. "Proneness" to accident is at once an attribute of the disturbed personality, the impaired physiology, and the unsafe conditions of environment.

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—Courtesy—American Journal of Public Health.

The foregoing article deserves to be read by all. We recommend its perusal particularly by those in authority who are compelled to accept vicarious responsibility for catastrophes resulting from so-called accidents. Madras Government General Hospital has been the scene of tragedies resulting from accidents. A patient, we understand, was moved to the mortuary, by accident of course, thinking that he was dead. Fortunately, however, some one saw that life was still lingering in him and removed him to the ward!

—Ed. P. H.

SCIENTIFIC FARMING MEANS LARGER CROPS

by

Robert M. Salter

Adopting techniques derived from agricultural research, American farmers have greatly increased farm efficiency.

This article appeared in the July 1949 issue of *The Southern Planter*, a monthly magazine published in the United States, devoted to progressive agriculture, horticulture, livestock, etc. The author is chief of the U. S. Bureau of Plant Industry.

American farmers harvested the largest total crop in 1948 ever produced on farms in the United States. That crop reflects no important expansion of acreage. Nor was it an accident of the weather. The weather was good, to be sure, but not unusually good. Instead, the crop was the product of greatly increased efficiency on farms, efficiency resulting from the adoption, to an unprecedented degree, of improved practices derived from agricultural research.

Numerous factors have contributed to this change. In general, the United States has had an environment favorable to the rapid adoption of more efficient crop-production methods. High prices for farm products, the patriotic urge for increased production during the war, the availability of agricultural credit and of government assistance for soil conservation have all been a part of this environment. Yet all of these factors would have been ineffective had there not been available at the same time a large fund of information on more efficient methods of production and, equally important, large numbers of improved higher yielding crop varieties—the product of scientific research in agriculture.

Hybrid corn offers a dramatic example of scientific accomplishment in crop production,

In normal growing years, farmers now add at least 750,000,000 bushels of corn to their average annual crop by planting hybrid seeds. The return from hybrid corn each year is more than 100 times the total expenditure for corn-breeding research during the last quarter century by both the Federal and State Government. Less dramatic, but equally important, has been the increase of 15 to 20 per cent in wheat yields through the breeding of improved wheat varieties. During the same quarter century new and improved wheat varieties were developed that make possible billion bushel wheat crops.

Similar disease control progress has been made with oats, sugar beets, potatoes, tobacco, and many other crops. A new disease, helminthosporium blight, struck the oat crop in 1946. In 1948, there was enough seed of newly developed blight-resistant varieties to supply a major part of the affected area. Unquestionably, those new varieties contributed substantially to the size of the 1948 oat crop.

Much of the success in breeding for disease resistance, and in improving other desirable qualities of various crops, can be credited to foreign germ plasm supplied through a program of plant exploration and introduction. In

addition, that program has to its credit the introduction into American agriculture of such major crops as soybeans and lespedeza, as well as many minor crops.

During the same time that plant breeders made so much progress with new and improved crop varieties, soil scientists made significant advances in the field of soil management and fertilizers. Research has revealed a great deal about soil acidity and how to control it; about ways to reduce erosion and to conserve water for growing crops; about the use of crop rotations, legumes and green manures for replenishing soil humus and nitrogen; and about materials, methods and machines for meeting these needs efficiently.

Modern methods of soil classification have made it possible to transfer new information on soil and crop management from the experiment station to the individual American farm. There is still a long way to go before the optimum efficiency in soil management is reached. One of the big potentialities lies in improving soil structure. We are learning more and more about the physical condition of the soil, its granulation and porosity. With improved soil structure, plants have better roots. They make more effective use of nutrients and water. Rain water enters the soil more easily.

Research in improving soil structure is difficult but is yielding promising results. For example, recent work has increased yields of:

1. Sugar beets from less than two tons to more than 13 tons per acre on heavy clay soils in north-west Ohio by tillage, manure, and crop residue treatments that increased the percentage of large pores in the soil.

2. Cotton from 900 to 1,300 pounds per acre in Alabama by tillage treatments that avoided compaction and maintained the high total porosity of the soil.

3. Onions up to 310 percent in Rhode Island by using rotations involving grasses that gave a high degree of aggregation in the soil.

4. Carrots from three to 35 tons per acre and potatoes from 12 to 258 tons per acre in northern Indiana by reducing the level of the water table in the soil.

In soils covering millions of acres, improvements in structure below plough depth are even more of a problem than in the plough layer. The value of increased fertility and better structure in the surface soil is seriously limited by an impermeable subsoil layer that impedes drainage, aeration, and root penetration. The improvement of this may require special deep tillage, deep liming and fertilization, and specially designed crop rotations. On claypan soils in Missouri, highly beneficial effects of sweet clover roots in opening up the subsoil were achieved where deep tillage was combined with deep placement of lime and fertilizers. Neither the tillage alone nor surface fertilization alone was effective.

Agricultural engineers are convinced that no more than 50 per cent of the potential savings in labor and other costs that research on power and machinery could make possible has been realized. For example, precision planting is basic to complete mechanization of most field crops. Without accurate control of planting, the production of no crop has yet been well mechanized. A lack of precision planting has been a stumbling block with cotton, sugar beets, sugar cane, sweet potatoes, and forage legumes and grasses. One major impediment to the more rapid expansion of legumes and grass seeding is the high cost resulting from heavy seeding rates. Farmers must plant many times more seed than the number of plants needed for a full stand. The difficulty is, in my opinion, largely a lack of suitable methods for precision planting of legume and grass seed.

Soil and crop scientists in the United States are becoming more keenly aware of the high degree of interdependence or "interaction" among the various factors that affect the growth of a crop. For example, the amount of a given nutrient element required for maximum yield is not constant but varies with the supply of other nutrient elements, with the number of plants per unit area, with the amount of water available to the crop, with the degree to which diseases and insect pests are controlled, and even with the genetic makeup of the plant itself.

This process has been the basis of recent experiments in corn culture in the American Southeast. In 1944, experiments were undertaken in North Carolina to combine the plant breeders' knowledge of corn hybrids, the soil scientists' knowledge of soil types and fertilization, the crop agronomists' knowledge of time and role of planting, and the agricultural engineers' knowledge of improved methods for controlling weeds and applying fertilizer. Corn yields in this State had averaged about 20 bushels per acre. During the first year's experiment, yields of more than 70 bushels per acre were consistently produced when improved practices were applied in the proper combination. In one experiment since then, the yield was varied more than 100 bushels to the acre—from 19 to 121 bushels.

Corn experiments of the same type have since been carried out in all south-eastern States with generally similar results. The best practice combinations have been worked out and recommended to the more than 50,000 farmers in this area who have participated in demonstrations of this new method of growing corn. The average yield of all demonstrations is over 65 bushels yield to the acre. And more than 2,500 farmers have produced yields beyond the 100-

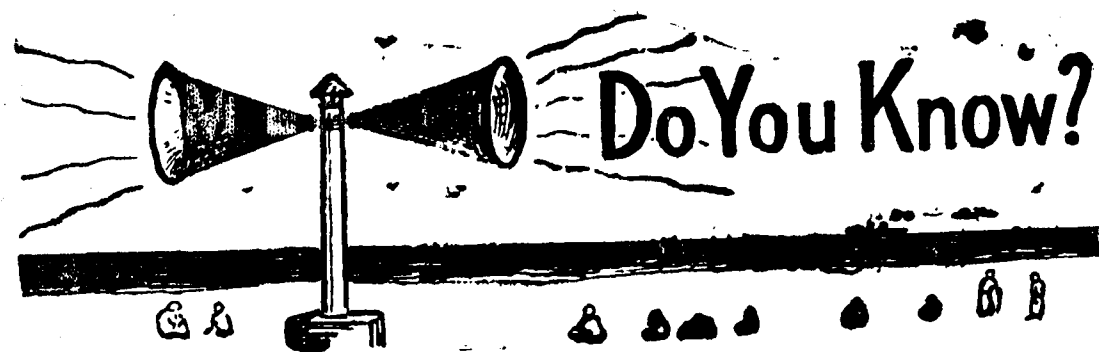
bushel mark. The 1948 average corn yield for all of the south-eastern area was more than 50 per cent greater than before the new practice combinations were worked out. And only a small percentage of the farmers have started using them.

This principle of increasing production efficiently through the proper combination of improved practices is not limited to corn. Practice combinations have been worked out to produce substantially larger yields of other crops under ordinary farm conditions in the Southeast. For example, oat yields up to 85 bushels per acre, wheat yields up to 30 bushels, and soybean yields up to 35 bushels have been consistently produced in a variety of practical experiments.

The same principle has been applied in irrigation research in the American West where we are also able to control water. We have had corn yields as high as 162 bushels, grain sorghum yields as high as 114 bushels, potato yields up to almost 600 bushels, sugar beet yields as high as 40 tons and alfalfa yields as high as 10 tons to the acre.

The results from these initial experiments give hope for more efficient production of many crops in many areas. Recognizing that lack of adequate high quality feeds in the South is the first limiting factor to diversification of livestock, the U.S. Bureau of Plant Industry and the State experiment stations have under way what is hoped will develop into a comprehensive research program aimed at expanding feed supplies. The program is keyed to the principle of applying new technology in combination. This approach to agricultural research appears to offer one of the greatest potentialities that lie ahead.

—(Courtesy, U.S.I.S.)



COUGH

Q.—What are the causes of cough?

A.—In the common respiratory diseases such as pulmonary tuberculosis, pulmonary abscess or other pulmonary diseases, cough is a frequent symptom, and the cause can be demonstrated by roentgen study and physical examination. Excessive smoking and chronic alcoholism produce local congestive changes in the pharynx, larynx and tracheo-bronchial tree which give rise to cough. Exposure to dust and fumes exerts an unfavourable influence on the respiratory tract. An extra-respiratory cause of cough may be irritation of the external auditory canal, or nasal and pharyngeal obstruction. Cough may be associated with the taking of food or fluid, in paralysis of the larynx, or in laryngeal disease. Severe productive cough occurring when one changes position suggests either pulmonary abscess, bronchiectasis or empyema with broncho pleural fistula.

—(TB. Abstr. Vol. XXIII No. 1).

THE RAILWAYS OF INDIA

DO YOU KNOW THESE FACTS AND FIGURES?

INDIAN RAILWAYS—1948-'49

Total miles open	..	..	33,860.85
Capital outlay (crores)	..	Rs.	775.77
Gross earnings (crores)	..	..	233.83
Total working expenses (crores)	..	..	183.88
Cost of staff (Class I Railways only)	..	..	..
(crores)	..	Rs.	82.52

Operating ratio (per cent)	..	..	78.64
Number of passengers originating	..	..	..
(millions)	..	..	1,180.60
Passenger miles (millions)	..	..	38,764.99
Earnings from carriage of passengers	..	..	..
(crores)	..	Rs.	92.91
Freight tons originating (millions)	..	..	82.58
Freight ton miles (millions)	..	..	22,748.16
Earnings from carriage of goods	..	..	..
(crores)	..	Rs.	112.26
Total train miles (millions)	..	..	167.61

On this historic occasion when India attains the status of an Independent Sovereign Republic, taking her honoured place in the comity of nations, the Railways of India look forward with hope and confidence to an era of useful activity by making their full contribution to the social and economic development of the New Republic. India's Railways now belong to the people and they are administered on behalf of the people by their own representatives. The Railways of India are the country's greatest asset. They cover a length of nearly 34,000 miles and have a capital outlay of 775 crores of rupees. In 1948-'49, their gross earnings amounted to 233 crores of rupees.

In any well-ordered modern society, an efficient system of transport is essential. And Railway Administrations are now seriously engaged in devising ways and means of improving their service and thereby enhancing their usefulness. Apart from merely providing transport, it is of paramount importance at present that travel is

Do you know?

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made more comfortable—particularly for the Class III passenger, who contributes most to Railway revenues. Evils, such as ticketless travel, have to be combated and put down and prompt and more courteous service assured to the public. This can be achieved only by unsparing and concerted effort on the part of all Railwaymen, high and low.

SIXTH SENSE

Q.—What is the "sixth sense" by means of which blind people find their way about?

A.—Blind people have no compensatory extra sense. What many of them do is to learn, either consciously or unconsciously, to make better use of senses they share with the sighted. For example, the tapping of the blind man's stick apparently enables him to judge the presence of obstacles by the way the sound is echoed back or deadened. Whistling or the sound of footsteps may serve the same purpose. In addition, many blind people seem to be able, without even thinking about it, to interpret small differences in the pressure of the air on their faces caused when currents are reflected back from walls, lamp-posts, and the like.

Ruahworth Fogg—The Hindu.

LEFT-HANDEDNESS

Q.—Do you know that the ancient Romans were against left-handedness?

A.—For, the right-handed they used the word dextral which, of course, is pretty close to dexterity. For the left-handed they used the word sinistral (no, not Frank!) which is equally close to sinister. On the other hand, the left-handed person is more apt to be a writer, an artist, or something just a little different. He can't help it. He was born that way.

—NTA REPORTER.

ARTERIOSCLEROSIS

Q.—What is the best medicine to take for correction of hardening of the arteries?

A.—There is no specific medication for correction of arteriosclerosis or hardening of the arteries, a condition that usually accompanies advancing age. The cause or causes have not as yet been definitely determined. In some cases an inherited tendency to develop arteriosclerosis is believed to be a factor.

Care consists principally in following the routine of sensible living—adequate amounts of rest, periods of work properly balanced with periods of recreation or play and the taking of a well-varied diet. Such a diet consists of properly prepared and adequate amounts of meat, fish, eggs, cheese, butter or oleomargarine, raw and cooked vegetables, fruits, whole grain cereals and bread.

It is advisable that a person be examined for any possible defects of body function and have them corrected whenever possible. The basic cause for arteriosclerosis in addition to the factor of heredity, is believed by some to be improper utilisation of food elements, the result of deranged metabolic processes. For example, arteriosclerosis is found frequently when overweight is observed.

—(Courtesy, Hygeia)

SACCHARIN

Q.—Does habitual use of saccharin in coffee and tea have any harmful effect?

A.—Because saccharin is an inert substance and is excreted from the body continuously, its use over an indefinite period of time would have no undesirable effects. However, arbitrary decision by a person to replace sugar with saccharin may on occasion be unwise. Careful medical evaluation of body needs, with a survey of daily activities, usually is a sensible procedure when one is considering a reduction in calorie intake.

(Adapted from Hygeia.)



*Wit's an unruly engine, wildly striking,
Sometimes a friend, sometimes the engineer.*
—George Herbert.

The Next, Please

"The best way to enjoy perfect health is to rise at five every morning and have a cold bath", says a doctor. O! well, what is the next best way?

Ill-Diet and Disease

Whatsoever was the father of a disease, an ill-diet was the mother.

Prescription for Poor Health

The doctor is sure that my health is poor; he says that I waste away; so bring me a can of the shredded bran, and a bale of the toasted hay.
—Walt Mason.

Worst of All

Of all the anti-social vested interests the worst is the vested interest in ill-health.
—G. B. Shaw.

A Paradox

The more we do, the more we can do; the more busy we are, the more leisure we have.
—Hazlitt.

Advance Notice

A celebrated man was taken to a hospital with an attack of appendicitis. The local editor, hearing the grave news, crowded into his final edition a paragraph which read: "Our esteemed fellow townsman, Jonathan Winterbottom, will be operated upon to-morrow at All Souls by Surgeon Snippit for appendicitis. He will leave a wife and seven children."

Not Available!

Twenty ordinary cigarettes a day, says a doctor, can do no harm to the average person. But judging by the advertisements there are no ordinary cigarettes.

Yardstick for Happiness

Happiness consists in being perfectly satisfied with what we have got and with what we haven't got.

National Progress and Decay

National progress is the sum of individual industry, energy, and uprightness as national decay is of individual idleness, selfishness, and vice.
—Smiles.

Rise and Fall of Rome

Rome grew with sanitation and declined with its decline.

Kill to Live

The doctor had put Pat on a strict diet. "Shure," roared Pat indignantly, "yer going to kill me with starvation for the sake o'keeping me livin' a whoile longer."

Reason why

One should always be in love. That is the reason one should never marry.
—Oscar Wilde.

Moderation in Food and Health

He who goes to bed thirsty, riseth healthy.
—English Proverbs.

Destroy while Preserving!

He destroys his health by laboring to preserve it.
—Vergil.

Rich and Poor—Defined

The true way to gain much is never to desire to gain too much. He is not rich that possesses much, but he that covets no more; and he is not poor that enjoys little, but he that wants too much.
—Beaumont.

Value of Self-Control

There is no possession more precious than self-control. Watch therefore as you would watch treasure.
—Kural.

Duty and Happiness

Happiness will never be found so long as your back is turned on duty.

Vicarious

"I can't quite diagnose your case," said the doctor. "I think it must be drink."
"That's O.K., doctor. I know just how you feel," said the patient. "I'll come back when you're sober."

Vaccination against Cheerfulness

Cheerfulness is catching, but it seems like some folks have been vaccinated against the infection.

No Right to Talk

Those who do not read can have nothing to think, and little to say.
—Dr. Johnson.

Leave it to a Pathologist

Family Physician (after consultation): "Mr. Smith, I congratulate you most heartily."
Patient (Excitedly): "I will recover, doctor?"
Family Physician: "Well-er! Perhaps not exactly that, but-er well after consultation we find that your disease is entirely novel, and if the post-mortem examination should prove this to be a fact, we have decided to name the disease after you."

Excuse more than a lie

An excuse is worse and more terrible than a lie; for an excuse is a lie guarded.
—Pope.



"Books are Weapons in the War of Ideas." "Some Books are to be tasted, others to be swallowed and some few to be chewed and digested" . . . and some to be eschewed!

Name : COMPOSTS, THEIR IMPORTANCE AND THEIR MANUFACTURE.

Author : Dr. S. V. Govinda Rajan, Agricultural Chemist.

Issued by : Agricultural College and Research Institute in Mysore, Herbbal, Bangalore.

Pages : 9. **Size :** 8"x 5½".

Published : In 1949. **Price :** Not fixed.

India is largely an agricultural country and in order to support her ever-growing population, it is very necessary to increase the agricultural production, especially food-grains. This could be achieved by bringing all arable land under the plough, and by increasing the yield per acre. As the possibility of extension of all cultivable land is limited, other methods of increasing yield should be exploited. One method is to improve the soil fertility. The drain on the soil due to continued cultivation has been so heavy that its fertility is very much reduced. The need for and importance of improving the fertility by application to land of organic manure, Nitrogen, Phosphoric acid, Potash, etc., has never been so great as now and is rightly stressed in the pamphlet.

The author explains elaborately the practical methods of preparing farm yard manure and compost. The details of the methods of manufacture of manure follow standard lines and will serve as a useful guide to ryots and local bodies. The following observations are however made in this connection.

It is suggested that farm-yard manure usually made is poor in quality and could be improved by conserving and utilising urine of cattle along with solid refuse. How best this could be done, is however, not mentioned. In pucca cattle sheds, with impervious flooring, a catch drain within the roof of the shed—to avoid dilution with rain water—should be provided so that urine and semi-solid wastes may be let into a closed sump from which it can be pumped or baled out to the manure pit. In cutcha sheds, the agricultural waste, weeds, prunings of trees and plants and house wastes may be spread over the floor to catch urine and removed daily to manure pit.

The loose box system of dumping all agricultural and house wastes in the cattle sheds and removing them once in two or three months suffers from the disadvantage that the cattle will have to stand or lie down on their own waste products for long periods with the result that their health will be affected.

The method of manufacturing compost from human waste eliminates nuisance of smell and avoids to a great extent the breeding of flies, as the heat generated in the process of aerobic disintegration is too high to allow the larvae to thrive. In the trench method of preparing compost, detailed in the pamphlet, there is however a possibility of larvae escaping into the sides of earth-lined trenches and hatching into adult flies. This has to be guarded against as otherwise

it may be a fruitful source of dissemination of disease. The Officer-in-charge of compost scheme in Madras in 1944, evolved certain cement lined trenches for complete elimination and destruction of fly larvae and preparation of compost at a cheap price without the necessity for turning compost during manufacture. The data collected in the experiments conducted in Coimbatore reveal that, as an interim measure, fly breeding can be controlled by keeping poultry on the compost ground. This biological method of control of flies may be adopted till permanent cement lined trenches are constructed. The Sub-Committee of Health Survey and Development Committee, which visited the Training centre in 1944, commended the long and short term methods of control of flies.

In passing, it may be stated that the considerable heat developed in the process of preparing compost, will eliminate majority of weeds wherever preparation of compost is done as a routine.

The author recommends that the compost heaps may be covered with a layer of earth to prevent fly breeding and smell nuisance. If sufficient earth is available, this may be adopted. But the earth excavated by digging trenches will have been used up in the first three or four years as it is removed along with manure. There is need for economising use of earth. The observations made at Coimbatore during the training of Sanitary Inspectors by the Officer in charge of Compost Scheme, showed that the temperatures at the top layers (top 6 inches) of heaps without earth were higher when compared with those in heaps covered with earth. This indicates that covering of heaps with earth is not essential for successful preparation of compost under South Indian conditions.

The food situation in the Country, especially in Mysore, is not satisfactory. Every attempt that will contribute to increased production of foodstuffs, should be commended. The pamphlet places the scientific information available regarding preparation of farm-yard manure and compost in the hands of local bodies and ryots. It has not come a day sooner and it is suggested that the pamphlet may be translated into the

local vernacular language, if it has not already been done, and widely circulated for the benefit of ryots as a part of Grow More Food Campaign.

T. R. RANGASWAMI,

Assistant Director of Public Health, Madras.

Name : SECOND YEAR OF FREEDOM

Publishers : An Indian National Congress Publication, New Delhi.

Size : 6"x 9½" **Pages :** 160 **Price :** Rs. 3-8-0.

Published by the All India Congress Committee, this well got up book tries to paint a rosy picture of the conditions in India, and the measures taken by Congressmen in office to maintain peace and happiness. Comprehensive surveys of the activities of all Government departments are given. In the general introduction, the compilers boldly state "*. . . the immediate challenge to the foundations of the new State had been met and successfully answered (Italics ours)*". However, to see if health—the real and only foundation needed—had been "*successfully answered*," one might be tempted to peruse the detailed chapter V on Public Health. The shock comes here.

"*During the second year of Independence, effective steps were taken to encourage cleaner living and to improve the health of the people (Italics ours)*", they say. But from the next line onwards there is a catalogue of the number of hospitals opened, improved, or under construction; methods adopted to "*check*" diseases like TB, etc., BCG, DDT and so on. So that is how *cleaner living* is encouraged. The tale is a sad one and perhaps irrelevant here, for what are the publishers to do if their brethren in power act unwisely. Their responsibility ends with getting up a faithful chronicle; this they have done and very well too.

To conclude, this publication is valuable both to the supporters of the party in power and also to the many who scoff at the Congress, for the reviews provide material for both platform affrontery and public adulation of Ministers. The book is therefore doubly precious.

—V.P.R.

FROM EVERY WHERE



WHAT DO THEY SAY ABOUT IT?

Readers can contribute to this section. They are requested to send extracts of current literature which, in their view, would interest the people.—Ed., P.H.

HARD WATER AND HEALTH

Q.—Is there any evidence that water containing from 3 to 35 grains of hardness has been the cause of any illness of any kind. The hardness is due to a mixture of calcium and magnesium salts. Does water softened with zeolite have any effect upon body metabolism? Would water from which the calcium has been removed tend to dissolve calcium from the tissues? Are deposits such as gallstones or kidney stones due to excess of minerals in the water or are they due to glandular upset?

California.

A.—No satisfactory scientific evidence ever has been presented that any degree of water hardness can be considered the cause of any body disorder. The minerals contained in hard water are absorbed by the body as they are needed, and any excess is removed in body excretions. The various systems of the body have excellent selective ability, and do not automatically take up all the minerals and other substances provided in the daily diet.

When water is softened with zeolite or other preparations, an ionic exchange occurs, sodium replacing the calcium and other minerals in the hard water. For example, calcium chloride becomes sodium chloride as the water passes through the softener. No other reaction occurs, and no chemical or mineral is actually added to the water. In patients for whom low sodium diets have been recommended, it might be necessary to take this matter of additional sodium into consideration. The attending physician probably can decide whether it would be a significant factor. According to a discussion of this subject in a recent issue of the *JOURNAL* of the American Medical Association, sometimes excessive amounts of alkali may result from addition of water softeners to tap water. It was pointed out that this could increase alkalinity of the water to the point where skin irritation might be produced. There is no evidence that taking of water softened in special systems connected with the water supply can be a specific cause of any internal disturbances.

Water from which excessive amounts of calcium have been removed would not tend to dissolve that mineral from body structures. Hard water is actually an unimportant source of calcium in the daily diet, and of course the de-calcified water comes in direct contact only with the lining of the stomach and intestinal tract, the passages actually being "outside" the body.

Gallstones and kidney stones form principally as a result of chronic infection or other damage that causes death of tissue cells. Clumps of germs or dead cells gradually accumulate and form the basis of the stone. Calcium and other minerals often are deposited on these, but this process has no direct relationship to intake of such minerals.

(Hygie—The Health Magazine)

RURAL SANITATION

Soil Pollution: The Lancet, Vol. 2, No. 7, August 12, 1939, pp. 384-385.

Cesspools and privies are potential sources of pollution for both surface and subsoil waters. In order to learn something of the vertical and horizontal travel of the bacteria involved, studies were made at the Field Research Laboratory of the Alabama Department of Health. The site chosen for the experiment was a fairly level field on a plain along the bank of a river.

A pit 3 feet square and 8½ feet deep was dug. This pit was sheathed with boards loose enough to permit the percolation of excremental wastes. Sampling wells, in the bottom of the pit, extended 3-4 feet deeper. Eight encircling wells, for sampling, were also dug, extending to a depth of about a foot lower than the depth of the pit. The pit itself was then provided with a concrete cover having an opening in the top into which was discharged the excrement of a family of nine.

Tests then run under varying conditions of water flow in the soil and height of water level indicated that there was chemical evidence of pollution 100-300 feet downstream in the soil

water, with the distance increasing as time went on. On the other hand, bacteriological evidence of pollution was obtainable for only a few feet, with the distance after a slight increase, decreasing with time. The probable explanation of this is the absorption of bacteria and other particulate matter on the soil particles with a consequent increase in the efficiency of filtration.

A further study took up the question of subsoil pollution in relation to possible contamination of the ground water from human excreta deposited in experimental latrines. Here it was found that pollution normally travelled in a downward direction, that it followed the direction of flow of water in the soil, and that it was much less from a pit used only for excreta than when water was added. Manifestly then, a dry system is safer than a leaky cesspool.

Sludge digestion such as occurs in a septic tank with consequent alteration of the bacterial flora of the peripheral layers in the pit, apparently accounts for the small distance travelled by intestinal bacteria from the place of deposit.

The moral of the above experiments indicates that in spite of the fact that bacteria have a way of being held up in transit, it would be wrong to bore wells anywhere within the zone of soil-water flow where chemical evidence of pollution is obtainable.

—J. H. RUGE.

(From "Public Health Engineering Abstracts"—Vol. XX)

WATER OR DRAINAGE TO HAVE PRIORITY?

"One may wonder why London's sewerage was properly established in 1870, while its water supply had to wait till 1899. The answer is that sewerage was a public service, and water was an article of commerce in the hands of companies. The companies were out to sell water—not to supply it, and so it was only with difficulty that they were forced to supply it to the poor districts. London was behind hand in

this respect, for many great towns established a public municipal water supply between 1830 and 1875. London's remained in private hands until 1905, when the Metropolitan Water Board acquired the companies' holding for the enormous—some have said exorbitant—price of £ 47,000,000.

The best measure of the effect of these sanitary reforms is the London Death rate. The figure stood fairly steady at round about 24 per 1,000 for the years 1847—1871, which date marks the completion of a reasonably good sewerage and water system. In 1873 the figure was 22.5 and in the last decade of the century it was 19.2—a change representing a saving of the lives of nearly twenty thousand Londoners every year. This change was due chiefly to improved sewerage and water; the further fall from 19 in 1900 to 11.8 in 1939 is to be attributed partly to these same causes and partly to a gigantic improvement in housing conditions and medical services. The figure 11.8 is by no means the best possible, as is shown by the fact that in some parts of London, e.g., Finsbury and Chelsea, the death rates are near 13, while in others such as Hampstead and Wandsworth they are not much above 10, while some large towns, such as Wolverhampton, also have death rates in the neighbourhood of 10 per thousand.

(*The Century of Science*. By Sherwood Taylor., 1942.)

LIMITATIONS OF AGRICULTURAL UTILIZATION OF SEWAGE

(Contributions to clarify questions propagated by Prof. A. Seifert) Karl Imhoff. *Deutsche Wasserwirtschaft*, 35, 275—77 (1940.)

Irrigational fields have lost their value because of the newly developed artificial processes of purification and land irrigation. In these processes the agricultural utilization of fertilizer material and water is of main importance.

Prof. A. Seifert commented in regard to the new process as follows:

"The cycle Man-Sewage-Food-Man is against every human instinct. The biologist must demand that sewage is at least biologically cleaned and the sludge fermented before it is used to produce human food. The spraying of fresh sewage is least advantageous biologically."

Seifert's demands may be supported further. The use of sewage has hygienic limitations. Public health instituted the entire sewage technique to prevent the spreading of disease from sewage to man. Therefore, especially in North America, complete purification and destruction of pathogenic organisms are demanded.

Economic limitations are considerable. The broad irrigation requires an area 10 times as large as an irrigational field and is 3 times as expensive as the best treatment plant. Neither city nor farmer can carry these expenses.

Technical limitations are important to consider. City sewage is very unstable and tends to develop into stinking putrefaction in storage beds, where they stand too long and settled-out sludge recontaminates the supernatant fluid, and in pressure pipes which, since they are constructed to hold the surplus rain water, are too large for the ordinary flow of sewage and develop into sludge beds.

Agricultural sewage utilization is responsible for this unfavourable situation by using the unpurified city sewage for reasons of securing financial aid from the city, which the city can afford to give because of the absence of a city sewage plant. The former incurs added expense and work by having to purify this sewage.

All of these disadvantages and expenses can be avoided if the sewage is biologically purified before being pumped into utilized open fields. Odor does not occur and hygienic qualifications are met. The sludge obtained may be converted into soil fertilizer by one of the new processes.

Then there will be no more objections against the spraying of sewage.

—WINSLOW WHITNEY SMITH.

(From "*Public Health Engineering Abstracts*"—Vol. XXII).

GARBAGE AND REFUSE

Health Experts endorse Landfills and recommend best practice. Engineering News—Record, Vol. 124.

A local controversy on landfill practice in New York City which involved indictments of prominent city officials, resulted in the appointment by the Surgeon-General of the U. S. Public Health Service on request of counsel and with the approval of the court, of a Board of health experts to study this problem. The members of the Board were drawn from various parts of the country and comprised responsible representatives of the medical and engineering fields. Their findings made public on March 15 were in favour of landfill operations if planned as an engineering project and carried out under direct supervision of a sanitary engineer.

Without implying negligence, sixteen recommendations were listed consummately setting forth the procedure to be followed from primary planning of the project to the ultimate completion of the fill and maintenance thereof after it has become stabilized. Recommendation number sixteen counsels that "studies of the varied problems involved in landfill operations should be continued and should include researches into the biological, chemical and physical activities, as well as the engineering, economic, and administrative aspects of the subject."

—A. L. G. PHILLIPS.

(From "*Public Health Engineering Abstracts*"—Vol. XX).

BRITISH HEALTH MINISTRY'S STANDARD

The dwelling should—

(i) be in all respects dry;

(ii) be in a good state of repair;

(iii) have each room properly lighted and ventilated;

(iv) have an adequate supply of wholesome water laid on for all purposes inside the dwelling;

(v) be provided with efficient and adequate means of supplying hot water for domestic purposes;

(vi) have an internal or otherwise readily accessible water-closet;

(vii) have a fixed bath preferably in a separate room;

(viii) be provided with a sink or sinks and with suitable arrangements for the disposal of waste water;

(ix) be provided with facilities for domestic washing, including a copper, preferably in a separate room;

(x) have a proper drainage system;

(xi) be provided with adequate points for artificial lighting in each room;

(xii) be provided with adequate facilities for heating each habitable room;

(xiii) have satisfactory facilities for preparing and cooking food;

(xiv) have a well-ventilated larder or food store;

(xv) have proper provision for the storage of fuel;

(xvi) have a satisfactory surfaced path to out-buildings and convenient access from a street to the backdoor.

We suggest that the above items, all of which we feel are essential to comfortable domestic life, represent a satisfactory target for the improvement of houses which are structurally adaptable and have a good expectation of life. We have purposely refrained from including in the standard any items which might be regarded as being in the name of luxuries.

(Extract from "*Report of the Standards of Fitness for Habitation Sub-Committee of the Central Housing Advisory Committee*".)

63. The minimum accommodation for each flat corresponding to a three-bedroomed house should be—living-room, kitchen, bathroom and a W.C., with two or more bedrooms and, in addition, reasonable provision for the storage of fuel, prams and cycles. For smaller families, the accommodation should be correspondingly reduced. Each converted flat should be provided with the following :

- (a) running water and a sink with draining-board ;
- (b) *water-closet (in suitable cases this may be in the bathroom) ;
- (c) a fixed bath, preferably in a bathroom ;
- (d) facilities for the preparation and cooking of food ;
- (e) an adequate and properly ventilated food-store ;
- (f) facilities, so far as may be necessary for the washing and drying of clothes ;
- (g) access to a sanitary dustbin and fuel-store without passing through a room occupied by another tenant.

* The number normally to be assessed on the basis of seven persons to one W.C.

(Extract from "Conversion of Existing Houses")

HOUSING

A Yardstick for Slums.—Alfred H. Fletcher. *Eng. News-Record*, Vol. 119,

A scoring system of slum classification has been developed by the Memphis Health Department. The system places a numerical value, or sanitary rating, on each house, based on the per cent of perfection as compared with a set minimum standard house. The key facts for judging the dwellings are : (1) Location, condition, and use of toilet ; (2) Location, condition, and use of

water and sink ; (3) Condition of screens, roofs, floors, walls, ceilings, and chimneys ; (4) The number of families provided for by the dwelling ; (5) The number of persons housed per room ; (6) The position of the dwelling on the lot (front or rear). These factors are assigned arbitrary numerical values with deductions being made for unsatisfactory conditions. By applying a factor known as the rear dwelling factor, a housing index can be determined for any block or group of blocks.

As rated by this system, the worst areas show a high per cent of vacancies, a low average weekly rent per unit, a low average number of rooms per unit, a low average weekly rent per room, but a high average number of persons per room.

The plan in Memphis at this time is to adopt and enforce a housing code beginning in the better slum areas and working towards the worst conditions. When the point is reached where further enforcement will result in slum clearance, some form of subsidized public housing at present seems to be the only plan for taking care of the remaining class of slum dwellers.

—V. M. HYNES.

("Public Health Engineering Abstracts")

ENVIRONMENTAL SANITATION

Foundation of Public Health.

More than seventy years ago Dr. M. von Pottenkofer showed how, in the city of Munich alone, bad hygienic conditions and the resulting high deathrate caused the loss of 3,400,000 working days each year. Thanks to von Pottenkofer's efforts to improve sanitary conditions, Munich, at that time scarcely more than a small town, was able to save 25 million florins over a period of twenty-five years.

—H. E. Sigerist,

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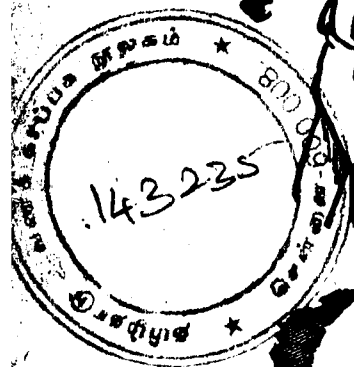
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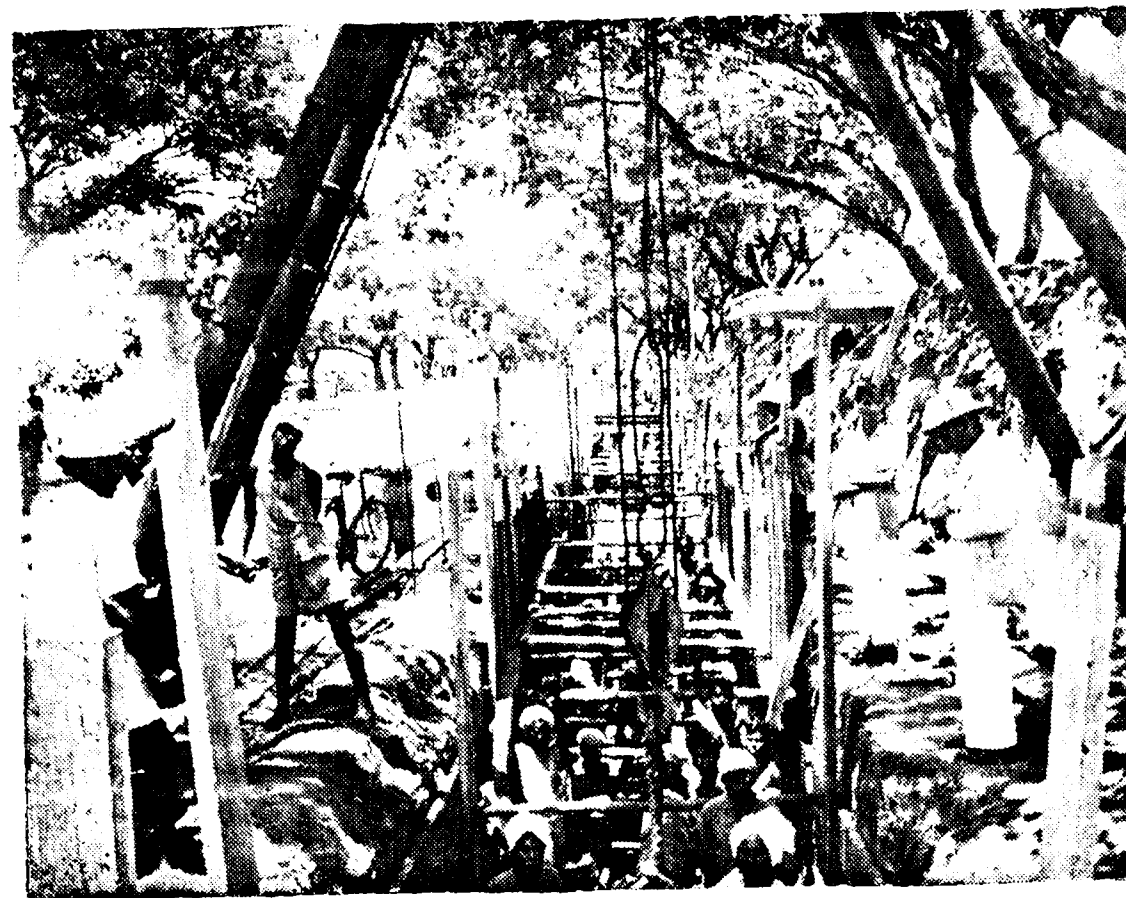
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