

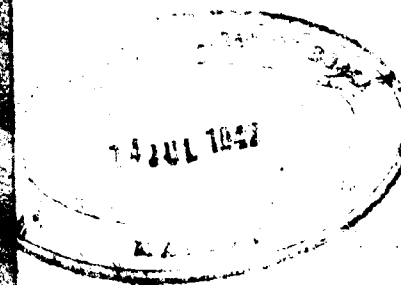
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PEOPLE'S

HEALTH

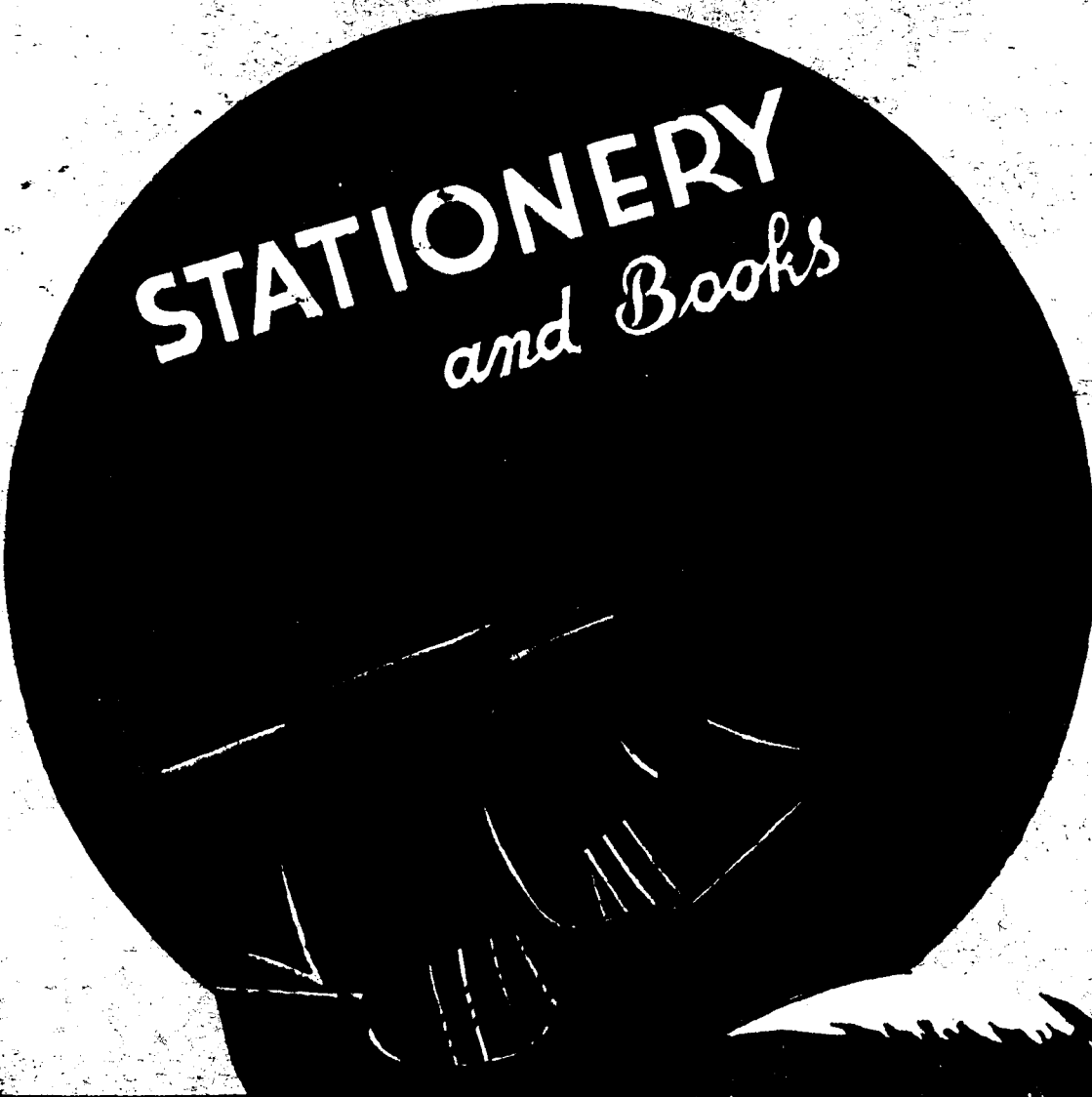
EDITOR: A.V. RAMAN



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This service is available to all life policyholders and their wives and children and members of our organisation. Application should be made to the Head Office in case of need.

2. A pamphlet has been prepared by an expert authority on "**Tuberculosis and its Prevention**" in Tamil and Telugu. Copies will be distributed free to policyholders on application. An English edition of the pamphlet will also be available very shortly.

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DEVELOPMENT OF ROADS

The Indian Road Congress held its 11th Annual Session at Trivandrum on the 5th February, 1947.

Sachivothama Sir C. P. Ramaswami Aiyar, Dewan of Travancore, in his inaugural address to the Session stated, *inter alia* :

"I am disappointed at the recent announcement of the Central Government proposing not to include Indian States in the National Highway Programme. It is nevertheless the intention of the Travancore Government to construct roads on the basis of the same standards as may be decided with regard to the All-India Highways Scheme "

* *

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PEOPLE'S HEALTH

A Pioneer in the Field of Public Health

Vol. 1

JUNE, 1947

No. 9

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The Surgeons, "The operation is quite successful."
The voice of the homeless, "But, the patient....."

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A PIONEER IN THE FIELD OF PUBLIC HEALTH !PEOPLE'S HEALTH!

VOL. I
No. 9

JUNE, 1947

ISSUED
MONTHLY

"Tuberculosis always comes from 'Tuberculosis'".

The 'soil' and the 'seed' are essential to the spread of the disease.

Improve the environment; the disease is checkmated.

EDITORIAL . . .

THE WHITE PLAGUE

THE members of the Tuberculosis Association, Madras, met at the end of April, 1947 and drew a depressing picture of the scourge in the Madras Presidency. The Association expressed its considered opinion that the provision of a clinic in every district, a sanatorium for a group of four districts, three clinics for 'ex-patients' and six 'homes' for incurables is the *least* that is required to stamp out the 'white plague'. The tendency of modern medicine is to lay special emphasis on the preventive approach to the problem, on the social and the communal aspects of health. It is therefore surprising that the Association did not direct its attention to the root causes of the prevalence and spread of the disease, and suggest remedies therefor.

Miloshe Skelish explains "What is tuberculosis?" in a little book,

of that name. The author has set out the case in simple language laying emphasis on the correct points. The home is an important factor, perhaps the most important factor, in the war against tuberculosis. A clean, dry, airy, and not over-crowded home, eliminates a most important causative factor in the incidence of the disease. This means it will be more difficult for the disease to gain a foot-hold in the home. Even if it does enter it, it cannot develop so readily; if, on the other hand, it does develop, it could be fought with a greater measure of success. An unhygienic home is a good breeding ground for tuberculosis, as it would be easy for the disease to gain a foot-hold and spread. A dark, damp, and dirty home with inadequate living space, lowers resistance to diseases. Homes of this type are particularly dangerous to children. In a home of this kind, isolation of

a patient is impossible. This type of home is found everywhere, in towns and in remote villages. The danger arising from such homes is greater in towns than in villages owing to congestion in every sense of the term. Over-crowded homes are bad enough. The conditions are made worse if a person suffering from tuberculosis has to sleep in the same room as other healthy people, particularly children. The situation is made infinitely worse if a consumptive is compelled to share the bed with any other person. Shortage of houses, and unsuitable design of homes are a social cause for tuberculosis. These facts go to show that bad home conditions form a vital cause for the disease. The provision of good houses is one of the *first* steps towards solving the problem. This has been proved beyond cavil by the index of mortality figures as in Denmark, where good, healthy homes have been provided for the working people and isolation homes for the consumptives.

Dr. G. Gregory Kayne sums up the situation in his well known work "The Control of tuberculosis in England", as follows:

"In regard to all forms of tuberculosis the improvement of the hygienic and economic living conditions of the working classes, must remain a measure *de premier ordre* for the prevention of tuberculosis."

It is depressing to see that those who are charged with the responsibility of providing homes for the people have not bestowed sufficient thought over the design of homes for our people. They are guided by

the so-called experts who swear by single-room or double-room tenement as though in our country, people want that measure of seclusion and protection against the weather as those who live in temperate and cold climates. The conventional design of homes with a courtyard in the centre offers amongst others a solution to the problem. The advantages of such a design need not be dilated upon here. Suffice however to state that bad homes in bad environment lower resistance, prepare the ground for the disease and facilitate its spread. Good homes, on the other hand, strengthen resistance and provide a poor soil for the spread of the disease. For, however potent the 'seed' may be, unless the 'soil' is suitable, it cannot sprout out.

When our medical curative friends shed tears over the misery of man afflicted with the disease, we are reminded of an old saying "take care of the geese when the fox preaches"! It is inexplicable how our medical curative friends can overlook so fundamental a fact as that the conditions which bring about the disease should be eliminated *before* measures are taken to increase facilities for treatment. Those who advocate more clinics, more sanatoria, and still more 'homes', seem to forget the fact that on the return of the patient to his home, there is every chance of his developing the disease again, possibly with fatal results. The medical curative experts' purblindness in another direction is more astounding. They shut their eyes to the source from which the cases come, to accommodate whom they clamour

for sanatoria. So long as that source is left alone untackled, more and more cases will be readily available for more and more sanatoria for which the clamour can be louder than ever before. A fine business proposition to make sure of supplies!

Those who compare the beds for tuberculosis patients available in this country at present, with those provided in others, forget a fundamental fact. In those countries, for over a century, practically from 1830 onwards in England for instance, every endeavour had been made *as the first step*, to improve the environmental and living conditions of people. We, in this country, have not done anything in that direction worth mentioning. What is the good of leaving the living conditions alone, and clamouring for more and more beds for patients?

No sane health authority can combat any infectious disease with the sole weapon of isolation and treatment. To make this the only plank in the platform, to harp on it at every turn and on every occasion and to clamour for its implementation, is, to say the least, hoodwinking the public. It betrays a deliberate intention to mislead if one omits altogether the other and more important aspects which should receive in fact prior attention. Thanks to the social and commercial upset caused by the recent war, plague takes a greater toll in Madras Province from wider areas. Why not apply the same principle to plague and rest content with isolation and treatment of cases? Do we not attempt to attack the very source of

infection by systematic rat and flea destruction?

Though it is well known that infections are also spread by the cup, dishes and table-ware generally, which had been used by tuberculous patients, no effective steps have been taken in our coffee and tea shops and eating houses to guard against the danger. Sanitation of these places is still in a primitive stage. In fact, sanitation of these places where food is prepared, stored and served is practically unknown. We know that many move about in ignorance that they are tuberculous. They may enter these places and spread infection. The medical men who are charged with the control of these institutions have done practically nothing. The truth of the matter is that they are not competent to do anything in this direction, even though they may be willing to do something. It is a field in which the environmental sanitarian should be given a free hand. Alas, he is nowhere in the picture!

Living quarters, factories and workshops, offices and schools, public conveyances, recreation grounds, public libraries, places of entertainment, such as music halls, cinemas, theatres and the like, are the most likely places where a healthy person runs the risk of contracting the infection. What measures have been taken to avert the lurking danger? None whatever.

Again, the working conditions have dire influence on the disease. Tuberculosis develops not only as a result of long hours and monotonous work but also of the unhygienic conditions

in the factories. Unenlightened employers are averse to introduce reforms which are costly and tend to reduce their profits. Hygienic conditions are very important where workers are using materials containing poisons or where it is necessary to effect frequent changes of temperature. As a result of these conditions, besides others not mentioned here, tuberculosis has developed in industrial communities. It has become largely a worker's disease. There is a prevailing feeling that industrial hygiene is a subject which the medical curative and preventive men could tackle. These professional men have their limitations. If the environment of factories should be congenial to health and conducive to efficiency of work, the Public Health Engineer has to play a big part in it which is entirely overlooked in this country.

Dr. H. Hyslop Thompson states that "tuberculosis is a disease of crowded communities the incidence increasing as social and hygienic standards of such communities deteriorate. Thus, tuberculosis may therefore be accepted as an accurate index of the social and health standards of a community."

All over the world, difficulties have been experienced in obtaining reliable and accurate figures of the number of people suffering from tuberculosis. The figures furnished for a country like ours where the registration of vital statistics even to-day is crude, should be taken with a big pinch of salt!

Our enthusiastic medical friends should not forget that the care of

the community cannot be carried out by medical treatment alone; but it must be strengthened by a general policy of improving the standard of living which will build up such resistance to disease.

While on this subject, we cannot resist making reference to the attempts which were made and which are still being made by well-meaning people in high authority trying to solve this and similar problems by charity. Lady Reading started the campaign for leprosy relief. Lady Linlithgow interested herself deeply in the fight against tuberculosis. In recent times, Lady Nye is interesting herself in collecting funds for 'welfare work'. The public should feel thankful to these high-placed ladies for the sympathy shown towards the suffering people. But such attempts result in diverting public thought from the central issue, namely, that the responsibility for relieving the distress of this kind rests solely with the State and no charity however munificent and spontaneous can achieve substantial results. They may leave a starving institution or a nominal organization here and there. These may keep the names of the sponsors in the public mind for some time. Charity alone can never solve the problem. We do not decry charity; nor is it our intention to discourage the flow of philanthropy for social relief. In fact, we wish that charity meets the needs of human welfare more effectively than in the old traditional ways. There is one danger in high-placed persons sponsoring charity. Their appeals leave an impression in the public mind that the problems for

which the appeals are made are to be tackled by charity alone. It lulls the public mind and deters it from enquiring what the State or the Government proposes to do to meet the problems. If those to whom the appeal is made turn round and ask "What are you doing about it? What is the State programme? How does charity fit in with it?", the sponsors may not find it easy to give a satisfactory answer. What we strongly plead is that the State should work out a programme for the eradication of these evils and that private charity should endow funds for specific purposes in the programme so worked out by the administrations. For instance, funds could be collected and earmarked for the investigation of a specific aspect of a problem. The Nuffield Trust under which researches have been carried out to promote the health of the people is an instance to the point. In America, some of the most valuable reports have been presented by investigations sponsored by private trusts and charities.

The present tendency to equate tuberculosis control with treatment has led to the work being entrusted to the medical curative department. Despite District Medical Officers having been in charge of it all these years, it needed the selfless efforts of a public health official to organize and run two sanatoria in our Province. Organization of surveys, follow-up work, amelioration of social conditions and other essential items of control work do not by any stretch of imagination fall within the ambit of the Dt. Medical Officer,

Nor is an officer steeped in curative work and judiciously avoiding all touch with the field, in any way competent to organize and carry out a full control programme. This is again another instance to show how in this country services have been organized under wrong heads of departments. The prevention and control of tuberculosis is primarily a public health problem and the Director of Public Health through the assistance of his field officers should be held responsible for the prevention of the disease. A curative man interested in medical practice can never be expected to do justice to this great and pressing problem. This is a further instance to show why the head of the administration of both curative and preventive medicine should be one with a preventive bias and not with a prejudice in favour of the curative side.

MADRAS CITY WATER-SUPPLY

A BREAKDOWN

Practically for over twenty-four hours, a third of the city of Madras was denied supply of water on 23rd May 1947. The inconvenience caused to the public by so unexpected and surprising a deprivation can better be imagined than described in so many words. The interruption, it is alleged, was brought about by a sudden defect which occurred in a 36" valve (sluice valve?) in one of the distribution mains. The operator of the valve, it is reported, found that the valve

was not lifting up while turning the wheel and this blocked the free flow of water!

The history of the operation of water works in the world is a long one and has recorded several cases of failure. But nowhere can an instance be cited in that long history of any defect in a simple sluice valve necessitating the denial of drinking water-supply for 24 hours to well nigh one-third of the citizens of any town or city! Any one who knows anything about the construction and operation of sluice valves would readily recognize that the excuse cannot hold water. We do not however propose to prejudge the matter before the full facts of the case are presented to the public by a responsible and independent authority, who knows all about the construction and maintenance of sluice valves. We would suggest to the Minister of Health that in the public interest, the matter should be examined by some competent authority and a detailed report setting out the exact circumstance which led to the interruption of the city water-supply should be published.

Under the City Municipal Act, the Corporation is not liable for damages for the interruption of water-supply owing to 'unavoidable' causes. The legislature has rightly provided this proviso to save the Corporation from the annoyance of frivolous and vexatious suits against it. But the facts are admitted that there was interruption in the water-supply for well over 24 hours and that the citizens occupying one-third of the

city have been put to untold inconvenience and annoyance. *Prima facie*, a suit will lie against the Corporation. The onus of proving that it was due to 'unavoidable' causes rests with the Corporation. The facts of the case would establish whether or not the non-supply of water was really due to 'unavoidable' causes beyond human control or the ingenuity of engineers. It would strike any one that it is a fit case for a test suit, but the plaintiff in the suit has to bear the brunt of it all over and above the expenditure involved in a litigation of this kind. So far as the Corporation is concerned, it is the rate-payer's money which will be thrown away in defending the suit! In this issue, we publish the concluding part of an article on the legal decisions relating to distribution of public water-supply by Frank A. Marston. We would commend a perusal of this article in particular, to our readers. Under the section "Law and People's Health" which forms a regular feature of this magazine, we have been reporting decisions of law courts to bring home to the mind of the common man his rights and duties as a citizen.

When the water-supply was interrupted, people had perforce to resort to wells which have been long in disuse and tanks steeped in filthy green emulsion. No steps were taken to render these sources safe. There is no method by which the evil effects of the consumption of water from sources of this kind could be ascertained. The safety valve of our administrators lies in the lack of statistical or even correct information.

The Commissioner of the Corporation has set out *seriatim* the measures he adopted to mitigate the evil resulting from the interruption of water supply. In a Press Note he says, "with a view to enable the public in these areas to draw water in order to meet their immediate requirements, hydrants have been opened and the public are allowed to take water." Every house holder knows that even under normal conditions of operation of the city's waterworks, the supply of water is given under such a poor pressure, that one has to wait patiently for quite a long time to fill a pot of water! When admittedly water could not enter a particular distribution main owing to the blockage of the sluice valve, how is it possible to draw water through hydrants fixed in those zones to which water supply has been cut off? Does the Commissioner seriously suggest that he means what he says? Or, does he take the citizens to be fools to swallow such palpably absurd stories? Such bluff may satisfy the City Council as at present constituted but not the public.

We are further told that a few lorries were engaged for the supply of water to the people. Some lorries might have plied to supply water to those in authority; but so far as we are aware, the common man had to struggle for a potful of water. In this connection, it would be pertinent to refer to the conduct of the officials in the classic case of *Read vs. The Croydon Corporation*. The officers while tendering their evidence before the court deposed facts which would *prima facie* go against them

personally. Their attitude was appreciated by the presiding Judge. Can we ever expect to reach that level of public conduct in our country? Unless the State steps in and takes strong action as and when necessary, we are afraid things will drift from bad to worse.

The Works Committee of the Corporation considered the question of taking steps to meet a similar emergency, should one arise in the future. It presumes that these small occurrences are inevitable! Or, in other words, it takes things for granted! The committee in its wisdom passed a resolution to the effect that ten lorries might be purchased and converted into water-tanks and kept in use for the Corporation. The *people* are not likely to be benefited by the purchase of a fleet of lorries for the purpose set forth. It has also resolved that during ordinary times, these tanks might be sent to the deficit water-supply areas for the supply of additional water to residents as also for cleaning the latrines and water table. During any emergency when there would be inadequate or no water supply, these tanks might be used for supply of water to the whole of the city. The attitude of the Works Committee adds insult to injury.

After all, it is admitted *now* that the rate-payer's money had been thrown away in the construction of fanciful-looking public conveniences without providing adequate supply of water to keep the system in order! What are we to think of the responsibility of our city fathers? It should be remembered that the members of

the Works Committee in common with their colleagues in the City Council, have long ago ceased to represent the rate-payers. We wonder whether they represent even the members of their own family! Such are our representatives in the City Corporation! Such is our Localself Government! Those who kept these 'representatives' of the rate-payers alive by administering artificial respiration as their days were nearing the end, are *prima facie* guilty of fraud on power. They are responsible for reducing our local administrations to mere mockery. One despairs how long this rotten state of affairs will be allowed to continue!

REGISTRATION OF NURSING HOMES

'Nursing Homes' spring up everywhere. Any building is rigged up as a 'nursing home' somewhat on the lines on which any hovel is hired for housing our hotels. No standards of convenience, comfort, amenity or nursing have been fixed. The patients have to pay what is demanded and suffer the inconvenience of being housed in these 'nursing homes', over and above the torture of pain from which they desire to be relieved in these homes. Unless steps are taken *immediately*, the disease is likely to develop into serious proportions. It should be clear that these 'nursing homes' are not opened with any altruistic, philanthropic or humanitarian object. It is a business proposition, pure and simple. Every business should be expected to invest

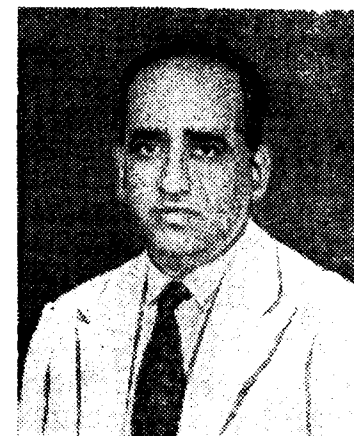
a capital. So also the promoters of these nursing homes should invest a certain amount of money for securing accommodation suitable for the purpose. We strongly advocate that the State hospitals should be confined to the treatment of the poor who cannot afford to pay. Those who can afford to pay should enter these nursing homes for treatment. It is therefore essential to encourage the opening of these homes *subject to the control of the State*. We also advocate that the medical officers of the State should be prevented from private practice. At the moment, the salary given to the State medical officers is something like a retainer with full freedom to devote their thought, talent, time and energy to their private practice for profit. Such of those as may expect a lucrative private practice are likely to give up the State service and open nursing homes. The State should encourage the exodus of medical men who have an eye to make money. The time is come for enacting legislation regarding the running of nursing homes. The Minister of Health should lose no further time in introducing suitable legislation in this behalf. Doubtless, the Minister will take care to secure sound advice as to the lines on which the legislation should be enacted.

We may perhaps, in this connection, draw attention to the fact that instances are not wanting where the so-called 'nursing homes' are utilised for purposes which would shock public opinion! The authorities can not be unaware of them.

ELECTRICITY IN THE VILLAGE

BY

G. SUNDARAM, M.A., M.I.E.E.,
Chief Engineer, Electricity
Government of Madras



ELECTRICITY is not merely a form of energy which gives us light and heat and runs industries large and small. It is a unique instrument for effecting social and economic progress and its potentialities in this respect are as yet little understood. It is mobile energy capable of instant transmission over long distances, convertible into diverse forms and usable in an extraordinary variety of ways. It can improve the standard of living of the masses as no other single agency can.

DECENTRALISATION OF INDUSTRY

For India it has a special meaning. Our way of life is centred in the village and all our plans for reconstruction aim at aiding the village to raise its living conditions by increased production of goods, services and amenities. From lessons learnt in the West, we know of the evils, social and economic, brought about by large scale industries centred in towns. We therefore prefer cottage and village

industries which allow the worker to live in his own home and amidst familiar surroundings. In other words, while we want industrialisation and increased production of goods, we want them so decentralised that every village and home is a centre of production. Electricity enables such decentralisation to be effected without difficulty as power in even minute quantities can easily and cheaply be made available in the village and the home. With the aid of electric power, existing rural industries be they for production of crops or for processing them, can be made to yield more. New industries can be created and fresh avenues of employment opened for the people, bringing in added wealth and better living for them.

USE OF POWER

In an average South Indian village, major use of electricity is for lifting water from wells for irrigation of food and commercial crops. To a lesser extent, it is used for processing industries based on the local agricultural products. The following classification indicates how power is

used in a typical village in the hydro area :—

Use.	Connected load.
Irrigation pumping	... 48 K.W.
Rural industries	... 26 „
Domestic lighting and other uses	... 14 „
Street lighting	... 1 „
Miscellaneous	... 1 „
	— 90 „

It will be seen that over 80 per cent of the load is for productive purposes. Use for domestic purposes is minor and this is only to be expected under the present low standards of income. So far as we can see, future use is likely to continue broadly on the same lines for some time to come.

ELECTRIC PUMPING

In the early years of the Pykara Scheme, some demonstration and propaganda work about the advantages of electric pumping was done but it is no longer necessary. The average peasant has become well aware of the stability and prosperity which electric pumping brings to agriculture. Water supply becomes copious and reliable, more lands get irrigated and more crops are grown. With the increasing dearth of draught cattle and their high prices, conversion of *mhotes* to electric drive is proceeding apace and over 12,000 applications are on hand for pump service connections.

PROCESSING INDUSTRIES

Hitherto, the agriculture produce of the village was being processed in the neighbouring town where power units had been located. Electricity now enables processing

being done right in the village and already there are over 1,000 such village industries doing rice hulling, flour milling, nut decorticating, sugarcane crushing, oil pressing, cotton ginning etc.

If we aim at the ideal that from each village should go out only finished products and not raw ones, rice not paddy, oil and oil products not oil seed and cloth not cotton, the villagers will have fuller employment and a higher return for their labours. Furthermore, the by-products of the processing industries such as husk, bran, oil cake and cotton seed will remain in the village to serve as manure and cattle food.

CO-OPERATIVE WORKSHOP

To conserve resources and enable the profits of the processing industry to remain with the villagers, a co-operative industrial workshop in each village is desirable. It can have all the processing machinery needed for the type of products grown in the area, each run in its season by a common electric motor. With a forge, a lathe, a drill, and a welding machine added to the workshop, all repairs of agricultural implements in the locality can be effected there. The traditional village blacksmith can be given training and installed as the principal mechanic in the workshop. He and his assistants can help to maintain in proper condition all the pumping sets, fans, household appliances, radio, and other electrical and mechanical equipment in the village.

COTTAGE INDUSTRIES

Individual cottage industries can be run with fractional horse-

power electric motors giving spare time occupation to the villagers and adding substantially to their incomes. If a multipurpose co-operative society is formed in the village, the village workshop and the cottage industries could be linked to it on the productive side.

SERVICES AND AMENITIES

Any scheme for rural reconstruction must programme for provision of services, like piped water supply, electric lighting and fans and amenities like radio and cinema. The village at present is drab and soul-killing and needs new life and comfort put into it. Electric pumping from the best well or wells in the village acquired for communal use, can ensure adequacy of drinking water supply. A few electric lights in the streets will bring cheer to the village in a measure far beyond their cost. They further help to keep the streets clean and sanitary. Electric light and fans in the home are amenities well appreciated by the villagers. Many now are unable to afford them but when they begin to earn more through better organised agriculture and rural industrialisation, they are certain to wire their houses and call for electric supply.

CLUB HOUSE

A centre for recreation and cultural pursuits has to be established for each village, a communal meeting place or club house, where people can foregather in the evenings, listen to the radio, and enjoy a cinema film or a play. The radio and the cinema, apart from their recreational value, are highly effective, educative agencies and any scheme of national re-

construction will have to make constant use of them to make the villagers aware of the policy and plans of Government and to enlist their enthusiasm and cooperation in their furtherance.

RURAL ELECTRIFICATION PROGRESS.

Let us now briefly review the progress made in this Province in rural electrification and see what can be planned for the future. About 1,000 villages in this Province have electric supply. The number of irrigation pumps run on electricity totals 6,500. There are over 1,000 rural industries mostly processing ones associated with the local agricultural products. The total connected load is around 42,000 K.W. Over 80 per cent of it is put to agricultural or industrial uses and the balance for domestic and street lighting and miscellaneous purposes.

Considering the number of villages yet to receive electric supply, the progress made so far is insignificant indeed, but it is even less in the other Provinces and States in India. Madras leads all others in the measure of rural electrification effected.

The Madras villager has definitely become electricity conscious and can be reckoned to make the best use of power if it is made available to him abundantly and cheaply. The Government Electricity Department generates 80 per cent of all the power used in the Province and before the end of this year the percentage will have increased to 95. For all practical purposes therefore the electric supply utility in this Province is nationalised and future

progress will depend on the initiative and enterprise shown by the Department and the Government in running the utility.

A TARGET

There are 35,000 villages in the Province. Of these :

13,700 have a population over 1,000
and

5,500 have a population over 2,000

It is desirable to aim at electrifying at least 5,000 of the larger villages in a ten year programme. How far such a programme is feasible depends on several factors, the main ones being availability, (a) of power generating plant, (b) of transmission and distribution line material, and (c) of consumers' equipment such as pump sets, piping, house wiring accessories and appliances.

THE ELECTRICITY GRID

Though Madras is not very rich in hydro-electric resources when compared to the other provinces, it has enough for all its needs for the next two decades at least. There are now three hydro stations in operation, viz., those at Pykara, Mettur and Papanasam. They are all interconnected for mutual assistance and through a Grid comprising over 3,000 miles of high tension transmission lines and 2,000 miles of distribution lines, they supply power over 13 districts in the south. Four thermal stations function in the Andhra area at Vizagapatam, Cocanada, Bezvada and Kurnool but they are not yet interconnected. It is the intention to extend the Grid gradually over the whole Province linking the hydro stations with the thermal ones and

adding constantly new power sources and new lines to meet the growing demand for power in the future.

The installed capacity of generation plant is at present 157,000 K.W. and construction work is in progress which would double the capacity within 5 years. Among the major projects in hand are the ones on the Moyar River in the Nilgiris and on the Machkund River in the Vizagapatam District. They would be in service in 1949 and 1951 respectively. Further power plants are planned at Periyar, Tungabhadra, Mekadatu and other places to be set up in due turn, as demand increases.

Progress just at present either in construction of power houses or in building lines is not very satisfactory and this is attributable to world conditions brought about by the war. Difficulties and long delays occur in getting electrical machinery and transmission line materials, in getting steel, in arranging transport and in getting sufficient number of civil engineers for field work. Difficulty is also being experienced in getting consumers' goods such as pumping sets, piping, switches and appliances. These hindrances to progress are likely to persist at least for a couple of years more and any programme must take account of them. If 1,500 more villages get electric supply in the next five years, we would have done well indeed in the prevailing circumstances. The following quinquennium may register faster progress if general industrial conditions improve and the target of 5000 electrified villages mentioned above, may yet be achieved.

THE PROBLEM OF NUTRITION IN INDIA AND THE RESPONSIBILITY OF THE PEOPLE

BY

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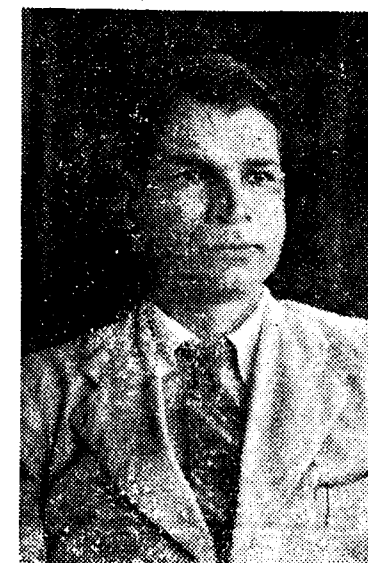
Coonoor

THE war and the acute food shortage in India have made the Indian people nutrition conscious. The central and the provincial governments in this country are also slowly realising the extent of their responsibility in assuring the adequate nutrition of the population which they govern. It is sad to note, however, that a heavy price had to be paid for this stage to be reached. It will be interesting to see how the increase in the public consciousness of nutrition and the realisation of state responsibility have gradually grown out of the desperate conditions brought about by the War. While doing this it will do no good to any one to apportion blame and indulge in recriminations. The intention of writing this article is to convey to the people that the solution howsoever difficult it may be, lies in their own hands.

During the first and the second decades of this century the discerning people realised that much of the

ill-health and disease prevalent in India arose out of malnutrition and undernutrition, the latter being probably the more important. This realisation gained strength when the advances in the science of nutrition threw light on the diseases arising out of particular dietary deficiencies and showed that poor nutrition undermined the inherent strength and resistance of the individual against disease. These generalisations based on observations elsewhere could be put to proof on a vast scale in India; only the investigators were wanting.

The problem of nutrition did, however, attract great deal of attention in the third decade of this century and has continued to do so during the last twenty-five years on an increasing scale. The investigations were undertaken from different angles, viz., the economic, food and health aspects. The method of approach tried by the economists was to evaluate the average per capita income and, based on the information



concerning dietary requirements obtained from other sources, to find out how far an average Indian could feed himself in a proper manner. They started, however, with some handicaps such as the lack of accurately collected statistics and the lack of agreement among themselves regarding the items to be included in computing the national income. The calculation of the per capita income by dividing the total national income by the number of people forming the nation may give a certain figure but there is no denying the fact that such a figure is bound to be extremely misleading.

The estimates of the annual per capita income made at frequent intervals by different authorities between the years 1868 and 1932 have varied between Rs. 20 to Rs. 107. Dr. Rao's estimate published in 1940 gave the per capita income as Rs. 48 and Rs. 162 for the rural and urban populations respectively. Even these estimates have been regarded by Dr. Rao's brother economists to be on the high side. Taking for granted, however, that Rs. 48 represents the per capita income of the rural population which is overwhelmingly large as compared with the urban variety, it needs no imagination to conclude that it is hopelessly inadequate to meet the basic needs of the individual.

The second possible approach to the problem was to find out whether the country produced sufficient food to satisfy the needs of the people showing definite signs of accelerated increase in numbers. Here again, the lack of properly kept statistics or, for certain categories and vast

areas of the country, of any statistics at all has proved a great handicap in arriving at any definite conclusion. These deficient figures, however, have been utilised periodically to assess the total food production in this country, and it has been possible to compare the total needs with the amount produced.

The opinion expressed by a competent authority in 1939, probably shared by others too, is quoted as follows, "While admitting that if the food supply remains at its present level, there is a danger that in the near future the population will catch up with it, we deny first that the rate of increase in the population is in itself alarming and second that there is any reason why the food supply should not be very greatly increased." (Prof. Gangulee in *Health and Nutrition in India*). Thus, it is apparent that before 1940, the food production was believed to be commensurate and probably in excess of the total requirements although a multiplicity of factors prevented its equitable distribution. The later estimates made during the war period however, indicated that the food production was getting inadequate. It became deficient in respect of cereals and pulses and grossly so in respect of vegetables, milk, eggs and flesh foods.

It will be clear therefore that even on theoretical considerations there has not been sufficient food for the past few years and when there was the people did not possess sufficient means to purchase their minimum requirements. Consequently, the conclusion is easily reached that there must be considerable amount

of undernutrition and, due to gross deficiency of protective foods, extensive malnutrition as well.

The evidence thus obtained by indirect methods was amply confirmed by the prevailing health conditions. The alarmingly high infantile mortality rate, the very high proportion of child mortality as compared with the total mortality figures, the low resistance towards disease and the last but not the least the poor physique of the bulk of the population are living proofs, if any were needed, of the effects of the long continued under and malnutrition. In addition to these, the nutrition surveys revealed extensive prevalence of incipient and chronic conditions traceable to deficient diets.

Such a state of affairs should not be allowed to prevail for long. But it did not seem to bother one much, least of all the government, who probably believed till recently that adequate nutrition was an individual's private affair. The last war with its world-wide repercussions administered a rude shock to such complacency, and in 1943 the United Nations were inevitably driven to proclaim that the nutrition of the population was a responsibility of the State.

The continued food shortage with little prospect of early relief from indigenous sources further brought home to the Government the gravity of the situation and the urgent necessity of doing something soon enough. The equitable distribution of the available food was the first step to be taken as an earnest of the

governments' intention. The rationing of cereals already undertaken in 1942 was considerably extended during the last four years. That this has been no easy task and was beset with numerous difficulties is common knowledge. Although rationing has relieved partially the condition of acute distress it does not go as far as it should to meet the basic nutritional requirements of the people. Even the quota of cereals is not uniform throughout the country. If it had been so, the individual would have been assured of his daily energy needs at least to a considerable extent. Under the present conditions he has to satisfy his requirements for other articles of diets, especially the protective foodstuffs, by a resort to the free market which, under the best of conditions prevailing these days, is most uncertain regarding the supply, the quality and, what is most important, the price of the material offered for sale. It was logical to assume that the governments would extend their rationing system to other foodstuffs. In fact a recommendation to the effect was made by the Nutrition Advisory Committee to the Government of India as early as 1943. It appears however, that on account of the administrative difficulties and considerations of finance the State was not willing to increase the scope of its commitments in this direction. The Provincial governments did try, however, in a few instances to afford relief by providing cheap or free milk to the vulnerable groups such as infants and children of preschool and school-going age. Even these schemes are

being altogether abandoned in some regions or are being curtailed in others. This indeed, is a sad state of affairs. It is only an indication of a return to the policy of *laissez faire* through which we have brought ourselves to this pass.

Such haphazard methods of tackling a vital problem evokes no protest because the people live in ignorance of the extent of the harm that has already been done, nor have they any workable idea in their minds about the steps that may have to be taken and sacrifices that may have to be borne before an average Indian can obtain freedom from hunger which latter seems to be the only one of his birthrights not denied to him. They do not realise that an average Indian infant is born with the severe handicap of an ill-nourished mother, nor that the infant faces a grim struggle throughout the growing childhood and adolescence of having to live on insufficient and grossly unbalanced diet. They do not realise that such damaged goods will procreate and bring into the world specimens of humanity who will be weaker mentally and physically than their forbears. They do not realise that unless the conditions are radically altered for the better, India will never be able to retain for herself or to enjoy for long the fruit of the political freedom that is in the offing.

People will ask what help the so-called nutrition experts are giving. They are doing as much as lies within the power of experts. It is no secret that the advice of the experts is not often acted upon whether it is given by experts in their individual capa-

city or given collectively by committees which more often than not are appointed by the Governments themselves. In this connection, it can be said with confidence that no better advice on matters connected with health and nutrition could have been given than is found in the report of the Health Survey and Development Committee of the Government of India published in 1946. The provincial governments occupied with other matters—probably more pressing according to them—will as usual take their own time to consider and to act on the recommendations.

I have refrained from burdening this article with figures or with the methods of combating the problem. I have done so because I have realised the insignificant contribution their enumeration makes to the actual solution of the problem in comparison with the labour involved. Besides, the fact remains that figures have been given a number of times in different publications by numerous authors. Apart from presenting the case in definite terms can one say that definite results have been achieved by their collection and presentation in tabular form? Frankly speaking, facts and figures are tiresome especially to those who do not want to realise their significance or having done so have no desire or inclination to act. The futility of presenting them breeds despair in the minds of people who take infinite trouble to marshall them only to find that their labours are wasted. But we cannot afford to despair: for, too much is at stake. If facts and figures do not spur the authorities

to action they must be supplemented or even replaced by constant propaganda through every available channel.

One fact must be faced however. We have been reduced to such a stage where no cheap and easy solution can come to our rescue. We may have to pay a tremendous price and bear considerable hardship, the extent of which cannot be fully envisaged to-day, in order to achieve the desired end. The current happenings, however, do not show any indication that the people are in a mood to face such a grim future even for their own good. There was a general belief in the millenium after the end of the war and now there appears to be a scramble for securing better conditions of life without a willingness to bear the cost. Since that has not materialized

a querulous mood supervenes. Unless people realise that war against poverty, disease and hunger can be equally gruesome, equally exacting as the bloody war through which we have recently emerged, probably lasting longer, and act up to their responsibility they have no right to expect any improvement in their condition. In this they are to blame and since it is they who elect their administrators they have to share the blame which it is all too easy to throw on the shoulders of the 'Government'. There is not the slightest indication that the people are alive to their own responsibility in the matter and the outlook remains bleak. It is futile to attempt to solve the problem of nutrition under the existing conditions of ignorance, apathy and lack of determination to pass through the stage of 'blood, toil, tears and sweat.'

LIME JUICE: ITS MERITS AND DEMERITS

Lemon juice is rich in vitamin C and doctors have recommended it at one time or another for rheumatism, colds, constipation, reducing. But some dentists sounded a warning: don't overdo it. Too much lemon juice may ruin your teeth.

Fifty patients had come to the Mayo Clinic complaining (among other things) of tooth ache and the gradual erosion of their front teeth. The dentists discovered that all of them had been addicted for months or years to lemon-sucking—or to an early morning drink of lemon-juice and water. Some patients' teeth were worn down to the gums. Mayo's experts decided that their tooth enamel must have been eaten away by the citric acid in lemons.

At Columbia 'varsity's dental college, Dentist Daniel Ziskin has decided that concentrated lemon and grape fruit juice, both highly acid, do indeed soften tooth-enamel. (orange juice, less acid seems to be safe.) But acid is not the only villain. The real damage is done by brushing acid-softened teeth with a stiff brush or gritty dentifrices. If not followed by too vigorous brushing, drinking diluted citrus juices once a day is perfectly all right, says Ziskin.

Nevertheless, the Mayo men, noting that more and more people are drinking lemon juice, believe that concentrated lemon drinks should be discouraged as a daily habit.

(From Times, April 7, 1947—Extracted by Miss M. Sakuntala.)

LABOUR CONDITIONS WITHIN THE FACTORY

INDUSTRIAL HEALTH

BY

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(This is in continuation of the article which appeared in 'People Health', pp. 352-54.

—Ed., P.H.)



VERY little has been done in the past in India either by legal enactment or in actual fact to deal with the subject which is known as Industrial Health in the industrialised nations of the West. This is shown by the fact that India does not have a single Medical Inspector of Factories and that research into this subject is practically non-existent. It is true that Doctors are employed in many Indian factories, but with the exception of two organisations, their work consists entirely, as far as I have seen, in controlling a dispensary for dealing with the ordinary illnesses of the people employed in the factory and of their families. So fully employed are they on this work that they have no time to go inside the factory and study the environmental conditions of work that may affect the persons employed.

Industrial Health, as now conceived, can be divided for practical purposes, into two departments: (1) The control of specific diseases

due to the use of certain substances or due to certain processes in factories; and (2) The protection of the general health of the operatives from ailments that may be due to defects in ventilation, humidity, excessive heat and the like, effects which may affect the general health of all employed persons. The control of the first is the primary duty of the Inspectors of Factories enforcing legislation that is now well-known and accepted. While the second, though in some degree controlled by legislation, is becoming more and more the sphere of the Industrial Medical Officer, who, of course, also takes his share in the control of Industrial Diseases.

The father of the study of direct Industrial diseases and of the institution of legal enactments to control and prevent these diseases was Sir Thomas Legge, appointed the first Medical Inspector of Factories (in any) in Great Britain in 1898. His first great work was an attack on Lead Poisoning and the

result of his work and of that of his colleagues in the Factory Department, is shown in the number of cases of Lead Poisoning reported in U.K.; in 1900 the number was 1058 and in 1945, 45, while we know that the actual reduction was even greater because in 1900 the cases were not all reported while to-day all are known.

In his fight against this disease, Legge laid down four principles that, while aimed particularly against Lead Poisoning, can be applied with almost equal force to other similar diseases and some of them even to the prevention of accidents; they, therefore, warrant the closest study by all concerned with the well-being of workers in factories. *They are:—

(1) Unless and until the employer has done everything—and everything means a good deal—the workman can do next to nothing to protect himself, although he is naturally willing enough to do his share.

(2) If you can bring an influence to bear external to the workman (i.e. one over which he can exercise no control), you will be successful; and if you cannot or do not, you will never be wholly successful.

(3) Practically all industrial lead poisoning is due to the inhalation of dust and fumes; and if you stop their inhalation, you will stop the poisoning.

(4) All workmen should be told something of the danger of the material with which they come into contact and not be left to find it out for themselves—sometimes at the cost of their lives.

The carrying out of these precautions requires the closest co-operation between doctors' engineers and chemists, both in the factory and in the ranks of Factory Inspectors. Any success that may have been gained in the United Kingdom has been due, in a large measure, to the team work that exists between Inspectors with varied qualifications and again in the confidence and trust that exist between these Government Inspectors and the heads of firms and their technical staffs. Without this team work and confidence little progress will be made. This requires first a keen Inspectorate competent in their work and alive to its value and also requires that this Inspectorate should be received by managements as friends and advisers who are out to help and are competent to do so.

As will be seen from the four points quoted above there are definite rules by which these dangers to health should be tackled.

First it is much better to get rid of the danger entirely by an alteration of the materials or process than to try and correct the evils. The outstanding example of this is the substitution of a safe Sesqui-Sulphide of Phosphorous for the dangerous yellow Phosphorous in the manufacture of matches. This was done internationally by the Berne Convention of 1906 and the dreadful disease of 'Phossy jaw' was swept away almost in a night. Other examples are the removal of the Silicosis risk from the cutlery grinders by the substitution of artificial for natural grinding

wheels and from some pottery processes by the substitution of alumina for silica in the bedding of china ware.

If this cannot be done then make the process safe by keeping the dangerous element under control. Formerly white lead in its wet pulp state had to be dried before being ground into oil, but a discovery that made it possible to convert the wet lead pulp directly into oil paint enabled the workmen to handle it without any dangerous dust being produced.

In most cases, however, the poisonous dust and fumes of lead and of many other materials, have to be controlled at their point of origin and thus prevented from entering the air breathed by the worker. To do this successfully has taken years of experience and experiment and only those who know what has been done and the difficulties involved can give sound advice. I would warn engineers that, however good they may be in their own line, they may easily make mistakes in this work of exhaust ventilation. It is always good policy, therefore, to call in expert ventilating engineers and to have the plans checked by the Factory Inspector. In my short experience in India, I have seen so many defects either of failure to control the dust and fumes in any way or in bad design where an attempt has been made, that I am convinced this is one of the points that should have early attention in Indian factories.

While I have used lead poisoning as my chief illustration in this article

because of the general use of lead industry, I would also ask for particular attention to be given to what, from my experience, is a wider danger in Indian works; that is the risk to health due to the breathing of fine silica dust that produces the dread disease of silicosis. The danger in factories is met in sandblasting plants, steel foundries, potteries, chipping and dressing of siliceous building material and indeed wherever siliceous material is allowed to produce dust that can be breathed. The process of blasting with sand has now been made illegal in the U. K. because the sand can easily be replaced by steel shot or other abrasive, but in India I still see, in some works, sand being used, without proper exhaust draught and even without any attempt to control the dust within the machine.

Space will only allow me to hint at the grave dangers to life and health that can arise through failure to control the dangers in the manufacture of Chromate or the fumes of Benzene, acids and the like. I can only add that expert advice should not only be sought on these obvious dangers but on many processes which may carry with them dangers unknown to those who control them.

In all this the Industrial Medical Officer and the Certifying Surgeon must have their share, because medical examination at stated intervals is the best and probably the only check on the success or failure of the efforts of the engineers and the chemists. In many industrial diseases, of which tar cancer is an example, frequent medical examination and

advice will ensure complete immunity. In addition this Medical Officer can do much in watching the health of the operatives in all processes and warning the management of danger signals that show that all is not well. It is to be hoped, therefore, that the Bill to cover Health Insurance that is now before the Legislature may in some degree relieve the present Medical Officers in factories from their dispensary

duties so that they may be able to fulfil the true role of an Industrial Medical Officer, but again I would warn the managements and these officers that this work should not be undertaken without special training in the field of Industrial medicine.

(By special permission of the author and

Labour Bureau, Government of

India.)

FINAL REPORT, COMMITTEE ON ADVANCEMENT OF SANITARY ENGINEERING

This elaborate report, dealing with the whole problem of the sanitary engineer, represents several years of effort on the part of a committee representing the sanitary engineering division of the American Society of Civil Engineers. The complete text embraces the suggestions of many sanitary engineers in the engineering section, American Public Health Association, and in the Conference of State Sanitary Engineers as well as in the Society itself. The discussion is conducted under 24 main headings. The report concludes with 11 recommendations.

Five sections of the report deal with the appointment, functions, and activities of the committee and with the nature and scope of the report as finally presented. Five other sections deal with the problems and activities of the sanitary engineer, his title, whether sanitary engineer or public health engineer, his academic education, and his early graduate experience and practice in the field. In 11 sections the opportunities for service are surveyed, the fields covered being the Federal health services; State, country or district, and city departments of health; industrial sanitation; consulting and other private practice, public works departments of States, counties and cities; salesmen of technical equipment and products; and as operators of sanitary works. The effect of the Social Security Act is reviewed and forecasted. An appeal is made for co-operation among sanitary engineering groups for proper publicizing of the work of the sanitary engineer and for better vocational guidance in the schools.

The report demonstrates that the actual and potential field of service of the sanitary or public health engineer is very broad and may be classified under 10 important categories, each of which is briefly described. It defines the term "sanitary engineer" and discusses the problem of a uniform title, whether it be "sanitary engineer" or "public health engineer".

The education of the sanitary engineer is discussed at length and a plea is made for his better, broader, and more specifically adapted training in those educational institutions of the country which essay to give such training.

The report presents figures to show what numbers of sanitary engineers are now engaged in the various fields of service and attempts to forecast the future opportunities therein.

The several recommendations with which the report is concluded deal with such matters as more complete co-operation between various groups of sanitary engineer members of several important organisations; with the basic education of the sanitary engineer; with problems of service and salaries; and with vocational guidance.

Charles Gilman Hyde (P. H. Engrg. Abstr., Vol. XXII.)

NATURE'S INFLUENCE ON EPIDEMICS

BY

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[The author has specially revised for publication here the talk he gave at the Madras Centre of the All-India Radio on 7-5-47.—Ed., P.H.]

DURING the last 2,500 years and more, physicians had noticed that certain diseases had the peculiar characteristics of affecting a large number of persons in a community within a short space of time. Their prevalence was mostly restricted to certain seasons in the year and the incidence and severity were unusually high at certain periodic intervals. The explanations which were attempted from time to time to account for these peculiarities had been lacking neither in number nor in variety.

Apart from the deistic concept of disease, several views were held, over a hundred years back. It was said that they were caused by breathing air, endowed with some special properties in certain seasons and years, peculiarities in individual temperaments and modes of eating and living, emanations of noxious vapours from the bowels of the earth due to inexplicable terrestrial and cosmic phenomena, accumulations of dirt and decaying matter, escape of poisonous gases from the ground due to the rise and fall in the level of subsoil water and so forth. The idea that a living contagion was

responsible for epidemics was conceived by certain physicians, who, however, failed to develop it. The observers of yore, who propounded the above views, believed in a common cause for all endemic diseases. The invention of the microscope towards the end of the 16th century helped to alter the old concept. The vast improvements and refinements in laboratory technique and in the study and diagnosis of cases further aided to establish definitely that these diseases, practically without exception, were caused by living organisms which are specific for each disease. But the experience and teachings of some in the past hold good even now in this sense, namely, that the phenomena which they attributed as actual causes of the diseases are only factors favourable to their occurrence. It is of interest to note, in this connection, that the renowned Ayurvedic physician Charaka (75 A.D.), in his book on medicine, has, while explaining the origin of epidemics, stated that although the people in a locality are of different constitutions and habits, yet, the sameness of Nature which they are exposed to, as for the matter of air, water, land and climate, produces the sameness

of changes and that the polluted air and water, abnormal seasonal variations in climate and changes in locality, bring about marshiness and increase in lower forms of life as mice, flies and mosquitoes; these in their turn cause the epidemics.

There are approximately one thousand and seven hundred diseases afflicting mankind. Of these, about 750 (roughly 48 per cent) are due to living organisms. Although this appears to be a formidable figure, it is only a few among them are of special significance. This is evidenced from the large amount of illness and mortality due to epidemic prevalence almost every year in some part or other of this country. These, otherwise termed as the 'BIG FOUR', so far as the Madras Presidency and the rest of India are concerned, are—malaria, cholera, smallpox and plague; to these may also be added Influenza which at periodic intervals sweeps the country from one end to another, as it did in 1918-19 causing heavy mortality. It should however, be pointed out that there are several other diseases caused by organisms, for example, tuberculosis, leprosy, venereal diseases, and the like, which, although not generally occurring as epidemics, are nevertheless of importance in the health and welfare of the nation.

In contrast with the non-epidemic diseases, those that occur in epidemic form bear some distinct and characteristic features. The most important of these are—special predilection for persons in certain age groups, prevalence restricted to a large extent to certain geographical areas or places with definite climatic characters and to certain seasons in the year, the lapse of a certain interval between the entry of the organisms into the body and the onset of the symptoms of the disease and lastly, the recovered patients being endowed with protection of varying degrees and duration against further attacks of the diseases.

The invasion of the body by microbes need not necessarily result in disease in all cases. In the first place, the microbes must be in sufficiently large numbers; if they are only a few, they will be washed away or destroyed at or near the point of their portal by the body fluids. Secondly, in conditions obtaining in Nature, a large number of the microbes die or lose their potency for mischief; only

those that are virulent are capable of doing harm. Thirdly, the microbes cause disease only when they enter the body by specific routes and settle in certain regions; for instance, while dysentery and cholera organisms are harmless when in contact with the skin, they cause disease if, after being swallowed in infected food or drink, they settle in the bowels. As regards the microbes therefore, the presence of sufficiently large numbers in a virulent condition and the mode of their entry into the body, are important factors in determining the onset of the disease.

Again, all the individuals in a community exposed to infection, are not liable to get an infectious disease to an equal extent or severity. Nature has endowed the body with a certain amount of resistance to infection; this resistance may have been further fortified by inoculation or vaccination or recovery from a previous attack of the disease. The chances of not getting the disease or getting it in a mild or severe form depend on the odds being in favour of the body defences or the microbes. Generally speaking, the most resistant individuals do not get the disease. The moderately resistant ones get it in a mild form; in fact, the symptoms in some are so mild, vague and transient that the cases pass unnoticed. They are nevertheless potential sources of infection, as are the severe cases occurring in the least resistant individuals. Further a certain proportion of healthy persons in the community harbour in their bodies the microbes of diseases for varying lengths of time; they are called carriers; they excrete the microbes at periodic intervals and serve as foci of infection.

An epidemic cannot possibly occur if the microbes are bottled up in an infected individual. If other persons are to be affected, the microbes must find an outlet and conditions for their transmission to others must be present. In respiratory diseases as influenza and pneumonia and eruptive fevers as smallpox and measles, the germs are transmitted from the sick to the healthy chiefly through infected droplets of nasal and oral secretions during coughing and sneezing. Bowel infections as cholera, dysentery, diarrhoea and typhoid are spread by contact, by the drinking of water contaminated by excreta or

consumption of foods and drinks infected by flies. The infection in some diseases is strictly insect-borne; infection in relapsing and typhus fevers is transmitted by lice; in malaria, filariasis, dengue and yellow fever, the infection can only be conveyed by certain species of mosquitoes in which the germs taken from infected persons must undergo certain development before the mosquitoes can transfer the infection to the healthy. Certain diseases affect lower forms of life and only incidentally man; an instance of this is bubonic plague. It is a disease of rats and man gets the disease as a result of the bite of the fleas which have fed on rats suffering from plague. In each factors necessary for its transmission if the factors necessary for its transmission are present.

One remarkable feature about epidemic diseases noticed by physicians of all ages is their relation to climatic conditions. The scanty knowledge in meteorology in the past probably accounts for the confused views on epidemic causation. Climatic conditions manifest themselves in seasonal changes in the weather which can be expressed in terms of temperature, humidity, rainfall, solar radiation and so on. The effects of season on epidemics may be brought about by its influence on man, the microbe and the conditions of transmission of infection. Most of us are aware of the differences we feel in physical and mental fitness as also in the general sense of well being in the different seasons of the year. How they are brought about by seasonal elements and whether the natural defences of the body also vary according to different seasons, are not definitely known. Secondly, there seems to be some evidence that healthy people who continue to retain disease microbes as a result of past infection, excrete the organisms to a much greater extent in certain seasons than in others, the foci of infection thereby being increased. The influence of season on the microbes is rather obscure. In the case of lower animals, there are definite seasons of rut. Even in human beings, there is considerable variation in the number of births occurring in different seasons, viz., the ratio of births occurring in the first to the second half of the year is about 100:120. There may perhaps be similar variations in the seasonal rates of multiplication among microbes. Extremes of temperature and dryness of atmosphere are

generally unfavourable to microbes. It is possible that the temperature and humidity during epidemic months are more conducive to the vitality of the microbes than in other seasons.

There is definite evidence of the influence of season on conditions affecting transmission of infection. Temperature and humidity are highly favourable in the earlier and later months of the year for the multiplication of rats and fleas concerned in the spread of bubonic plague, and the multiplication of mosquitoes concerned in the transmission of malaria. In rainy season and the colder months, people stay a much longer time indoors and the resulting crowding is favourable for the spread of house-borne and respiratory diseases. Decreased sunshine and exposure to rain and chill weather further favour the incidence of respiratory diseases. As regards influence of rainfall, filth is washed by rains into water sources; epidemics of cholera are therefore closely related to monsoons; further, domestic and public cleansing arrangements became greatly disorganized during rainy weather and the dangers of infection of food by flies are increased. The situation is often rendered worse by the congregation of large numbers of people at fairs and festivals. The great increase in the facilities favourable for the transmission of infection associated in all probability with some physiologic changes in man and the microbe is the chief reason for the occurrence of epidemics in certain seasons of the year.

If the prevalence of epidemics over long periods is studied, it is found that, besides annual seasonal prevalence, the incidence of disease tends to be unusually high, widespread and severe at regular periodic intervals; this periodicity is about five to six years in smallpox, cholera and malaria. Such studies are helpful in forecasting epidemics and adoption of control measures in advance. The cyclic recurrence of epidemics is explained as follows:—Recovery from an infection, irrespective of its severity or mildness, confers on the individual protection against a subsequent attack. What is true of the individual is likewise true of the community in which an epidemic has occurred. The increased resistance afforded by this protection varies from disease to disease and steadily diminishes with lapse of time. A stage is

eventually reached when the resistant derived from the previous epidemic is lost and the community becomes susceptible to a second epidemic. Births and immigrants during the period add further to the susceptible population. The interval of time during which this resistance is lost and a high proportion of susceptibles is reached, determines the periodicity of the epidemic of a disease.

The question which naturally interests the public is whether the seasonal epidemics could be prevented. Attempts to control the seasonal elements would be as absurd as King Canute's commands to the waves of the sea! Epidemic occurrences are governed by season, whose influence is greater on conditions favourable to the transmission of infection than on man and microbe. Conditions

affecting transmission relate chiefly to sanitation of the environment, control of insect-carriers and personal hygiene. Improvements in these have brought about substantial reduction in the incidence of epidemic diseases in other countries demonstrating thereby that the influence of seasons can to a measure be circumvented. Immunisation with vaccines, though useful as a personal protection in cholera, typhoid, plague, etc., can never be considered a substitute for environmental sanitation and hygiene. Lastly, another important requirement is the collection and scientific study of the relevant data of diseases, our knowledge regarding which is still incomplete. Further, these studies will be helpful in finding newer and better methods of prevention, control and treatment.

TO WHOM DOES THE CREDIT GO?

There was a tempest of respiratory diseases and the threat of enteric fever in the Second American Army at the end of the war. The inspector general, Colonel O., neither knew nor cared about that. He reprimanded a weary chief sanitary inspector for saluting him with one hand in his pocket. We pitied this poor gentlemen when we thought of all the buttons that were off and the puttees wrongly adjusted among a hundred thousand men. How he suffered and toiled! The same sanitary officer was trying to locate water points for the advancing troops in September 1918. "You don't exist for me," said Colonel H. of the Engineers. "You are not in the Tables of Organization." Occasionally there is a great soldier who knows, like General Bullard. He stands out by contrast. However, this may seem like spleen. But not at all; it leads up to our theme that soldiers have rarely won wars. They more often mop up after the barrage of epidemics. And typhus, with its brothers and sisters,—plague, cholera, typhoid, dysentery,—has decided more campaigns than Caesar, Hannibal, Napoleon, and all the inspector generals of history. The epidemics get the blame for defeat, the generals the credit for victory. It ought to be the other way round—perhaps some day the organization of armies will be changed, and the line officer will do what the surgeon-general lets him do. Among other things, this plan would remove about 90 per cent of the expenses of the pension system".

(Extract from "Rats, Lice and History", by Zinsser)

WATER IN RELATION TO HEALTH

BY

RAO SAHIB

SRI T. N. S. RAGHAVACHARI

(continued from page 413; May, 1947)

BARIUM.—This would apply *pari passu* to Barium which occurs in appreciable amounts in the drinking waters of Switzerland. This possibly has some relation to the prevalence of Goitre in severe endemic form in that country.

A recent report, I saw a few weeks ago in the journal of Endocrinology, however, denies the existence of any relationship between the incidence of Goitre and the silver and barium content of waters.

The above elements might however come into the picture in future years as our knowledge of various undiscovered factors and unexplained problems, increases. During the last 26 years in America and during the past seven years in the Madras Province, *fluorides* in water supplies have been detected and found to be responsible for a dental dystrophy (discolouration, brittleness, chipping, etc.) in children and certain bone troubles (spine, joints, etc.) in adults who were regularly using waters rich in fluorides—Such a condition was prevalent for 100 years and more in various villages of the Nellore and Guntur districts and was considered to be manifestations of *Syphilis*. It was given to me however to investigate this condition and detect the cause, as the action of fluorides present in large amounts in drinking waters on the dental and bone system. I found that where the fluoride content of water in the neighbourhood of 1 p.p.m. the dental discolouration alone was the predominant symptom and it was in areas



where the fluoride content of water was 3 p.p.m. and more that bone troubles occurred.

Ordinarily, fluoride in toxic concentrations is generally found only in underground water supplies and the problem is therefore in the main confined to the smaller communities, although in certain areas a comparatively small number of larger populous towns also are affected. The finding of fluorides in waters in our province is indeed a disconcerting feature but has to be faced squarely. The removal of these salts from water is a comparatively difficult matter but very promising results were obtained in the researches initiated by me at the King Institute, Guindy, in 1942. I believe some little progress has since been made in this direction. But in America patents have been taken out by some firms for "*Fluoride removal*" by using *adsorptive* materials with Base Exchange properties Aluminium Phosphate and Tribasic salts of various metals have all been tried with success of varying degrees. From what I have said above, you will think that fluorides constitutes a danger to health. During the past three years, the addition of small doses of fluorides to water-supplies has been advocated and practised in the U.S.A. as offering to the *most simple and practical means* for the prevention of *Dental Caries* in children. You know that 98 per cent of the children in U.S.A. have dental caries manifestly the result of eating too much sweets. This preventive treatment was the result of the practical observation made by their

research workers, that whenever a mottling of the enamel due to the use of fluoride waters was prevalent, the *incidence of Dental Caries* was low.

Between mottled enamel and bone troubles from too much fluorine and dental caries from too little, lies therefore a field for intensive and extensive research by Dieteticians, Physiologists Biochemists and Doctors, in order to discover just how the diet and drink intakes of the individual contribute to the making and maintenance of good tooth structure!!!

I must now tell you of the latest in water treatment—*viz.*—removal of salinity and brackishness from water. Can you get drinking water from sea water? Yes, by distillation. Is it possible to make sea water drinkable without having recourse to distillation? Your answer will doubtless be "NO" and an emphatic one at that. But my answer is "YES" and a much more emphatic "YES". This is one of the most revolutionary and marvelous discoveries of the recent World War.

Sir S. V. Ramamurthi (now the Member of the Indian Delegation to the "World Food Conference" at Washington,) then Chief Secretary to Government and Acting Adviser to the Governor, sent for me in 1942, one fine afternoon to the Secretariat and asked me if it was possible to render brackish water potable by some cheap and simple process—barring distillation. He instanced the processes occurring in Nature how the coco-nut trees on the sea coast take in sea water and give us sweet coco-nut water. At first sight, the problem appeared to me to be a wee bit ticklish but soon I found that the astute and practical administrator was out to solve a most intricate problem. He said that he was prepared to find the finance from Government for three years, if I would initiate a piece of research to discover some simple process for rendering brackish water potable and to forget all about it, if no successful results are obtained. Here was a real practical scientist who prized research for its own sake and did not bother about the results achieved. Even negative findings have their own positive value in the realm of research.

Agreeably to his wishes, I, in collaboration with the Directors of the King Institute and Indian Institute of Science at Bangalore, drew up a scheme of research, which was

approved by Sir Ramamurthi who got the Government to sanction Rs. 30,000 for this research for 3 years with promise of more if necessary. As I had to retire from service early in 1943, I handed over the research to an Assistant of mine—specially trained for this—and sent him to work at the Bangalore Institute. During the initial stage of this work, I found synthetic resins specially treated with certain chemicals were able to remove brackishness and salinity to some extent and that here lay a promising line to follow. What the subsequent work at Bangalore has shown, I am not aware of. But within a year after I initiated the experiments here, I read in the scientific medical journals—even the lay Press had extracts published—that a practical method (with a suitable apparatus for it) had been evolved by the Royal Navy and was installed in all sub-marines and ships whereby good drinking water was prepared from sea water by simply passing through the apparatus which incorporated some preparation of synthetic resin in its filtering medium. I am trying to get fuller particulars about this apparatus.

I have so far attempted to show that very few inorganic substances in the concentrations found in public water supplies have been found by scientific evidence to affect the public health. I will now pass on to a consideration of what may be called as the *Pharmacology* of water, *viz.*, the positive and beneficial results to be expected from the use of water. This would mean that I consider water as a medicinal agent. Yes, I do and for valid reasons. The human body contains nearly 80 per cent of its weight of water in one combination or another. Water is a remarkable solvent of gases and salts and a palatable drinking water always contains these substances. People from one locality rarely like the water in another. The salts present in water, though very small, in amount, impart a distinguishable taste to which we get accustomed.

Water is most essential to health. It aids digestion, elimination and the automatic regulation of body temperature. It is remarkable how quickly a glass of cold, and even more rapidly, a glass of warm water reaches the skin and by *evaporation* cools the body by the *dilution* of the blood aids circulation; by *dilution* of the food helps digestion and by *dilution* of the waste products, aids their excretion and elimination.

The dilution of our food, does not (as formerly supposed and even now believed by some old school people)—dilute the acid and pepsin in the stomach. It really increases their secretion and doubly aids digestion. Large quantities of water may be taken with meals with no ill effects, as the benefits resulting therefrom, include the increased flow of digestive fluids, the hastening and increasing absorption of food leaving less in the intestines for bacterial decomposition.

Drinking water allays the pain due to hunger contractions. Thirst for water is but a response to the concentration of salts in the tissues, a lessened flow of saliva and the drying up of the mucous membrane. The elimination by the kidneys and the skin must therefore be promptly restored.

Digestive enzymes are known to act only in a fluid medium and it is only the dissolved or suspended material that is really absorbed. As you know, it is only the moist air that is passed through the Lung tissues. Hydrolysis and the reverse are constant processes in Metabolism by which the protein molecules are converted into simple assimilable amino-acids. Even such a simple substance as sugar, requires the addition of a molecule of water to transform the disaccharide molecule into two monosaccharide molecules which alone are readily absorbed and utilized by our body. Few chemical or biological reactions can occur without water. Perfectly dry formaldehyde gas, or SO₂ would have no effect on dry bacteria and absolute alcohol has been shown to be equally ineffective as a germicide. But only with water added to each of these three, they become potent and rapidly acting germicides. I have actually demonstrated by experiments that 70 per cent of alcohol is the most potent and quickly acting germicide—dilutions stronger or weaker than 70 per cent being less efficient. 70 per cent of alcohol is now the dilution of

choice in hospitals for sterilization of syringes, etc.

Waters containing gases CO₂ or H₂S in solution are often used for their medicinal effects. Carbonated waters (Soda water) natural or artificial, stimulates the stomach into activity by a mild irrigation, thereby increasing absorption and necessarily therefore elimination. It aids in expelling flatulence from the stomach and intestines. It is more palatable and sharper to the tastes than plain water and is therefore used in fevers or where extra elimination is indicated.

If we pause to consider the minute amounts of the substances contained in water and attempt to assess the effects on our system of infesting these substances, only a very fertile and vivid imagination or a supreme faith in homeopathy as exemplified by its fractional doses, will recognize any specific value in those substances.

Palatability and cooking properties alone would be excellent guides in the choice of a good water supply for any community. People would automatically reject as unfit a water which is brackish or has a high solid content or is unduly alkaline which does not boil dhal, or which produces a discolouration of the rice boiled in it. If however there is no other and better supply available in any locality, they will of course take their choice with Hobson. Human instinct has seldom failed with assay of potability from the chemical point of view.

I may conclude that any adventitious circumstance, under which water is used, or any peculiar property, real or imaginary which will encourage a more liberal use of water is not to be under-rated in its bearing on health. The presence of pathogenic organisms favourable for water-borne diseases would therefore constitute the only important factor to reckon with in the use of God's great gift to man, viz.—WATER.

The action of water in our food is very important. There would be no carrying of food into the system but for the agency of water. It dissolves everything that we take; and nothing that we take as food can become nutriment that is not dissolved in water.—Dr. Lankester.

THE HEALTH OF THE STATE IS THE STATE OF YOUR HEALTH

BY

PURTEJ SINGH, M.S.
(HARVARD)



SEWAGE DISPOSAL— SEPTIC TANK.

FOR simplicity of presentation, sewage treatment has been discussed in the previous articles, only in terms of suspended solids. A real measure of organic load in sewage, is its biochemical oxygen demand B. O. D. Discussion in terms of B. O. D. would be technical and involved. For the purpose of popular articles, therefore, it is intended to confine ourselves to the conception of suspended solids only.

To continue the discussion on septic tank in the following pages are presented the design features and necessary tables and drawings.

DESIGN FEATURES

The size of a septic tank should be such that it gives a retention period of approximately 24 hours to the daily flow of sewage into it, with due consideration to sludge storage.

An important factor to bear in mind is that the capacity of a septic tank is reduced approximately 20

gallons per person per year by the accumulation of sludge. If cleaning of the tank is to be done at intervals of 3 years, 60 gallons per head must be allowed for sludge storage in the tank capacity. This is entirely overlooked by majority of septic tank designers. The usual figure in India is 2½ cubic feet capacity per user. This would mean that before a year is over the tank will be completely filled up with sludge, and during the preceding time the retention period of the daily inflowing sewage will be progressively reduced. This is obviously a major technical error.

The next thing is the provision of baffle walls in the septic tank. The septic tank is a settling tank, and what is required is that the sewage entering at one end, should flow with a slow uniform horizontal velocity, and the settled sewage should discharge at the other end. The objections to the provision of baffle walls, therefore, are as under :—

(a) The baffles do not permit a slow uniform horizontal flow.

Increased velocities and turbulence are introduced, which interfere with settling.

(b) The sludge storage space in the tank is curtailed. The space available will be practically, only up to the first baffle.

There is, thus, serious objection to providing baffle walls in a septic tank. Yet, all commercial and non-commercial designs in India introduce complicated baffles.

Lastly, full thought should be given to length, width and depth of the tank, to produce an efficient settling tank. The dimensions should be such that the full capacity is utilized, and there are no dead spaces or short circuits. For these reasons, tanks should be designed with a length not less than twice the

width and with a minimum liquid depth of 4 feet.

Design Tables.—With the above principles in view, liquid capacities of septic tanks have been worked out for domestic, and public installations, and are presented in tables 1 and 2. The following contribution of sewage has been adopted :

- 30 gallons per capita daily in dwellings.
- 15 gallons per capita daily in camps.
- 10 gallons per capita daily in day schools.

The liquid capacities in table 1 provide enough space for 2 years' accumulation of sludge and an additional volume equal to the sewage flow for 24 hours. However, the minimum size tank permitted is 500 gallons.

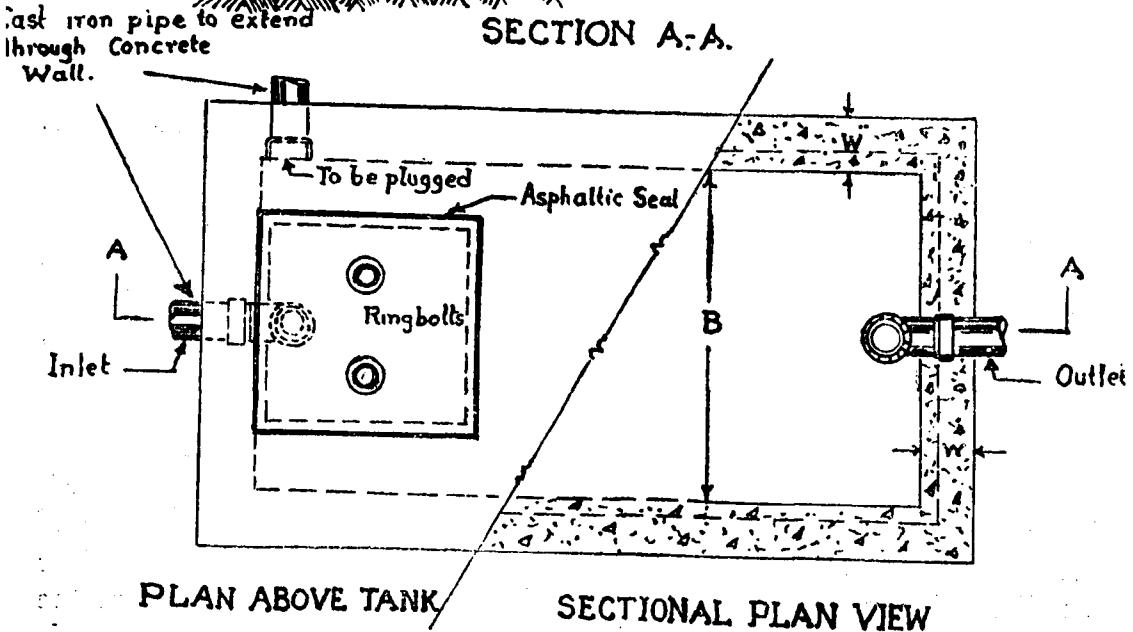
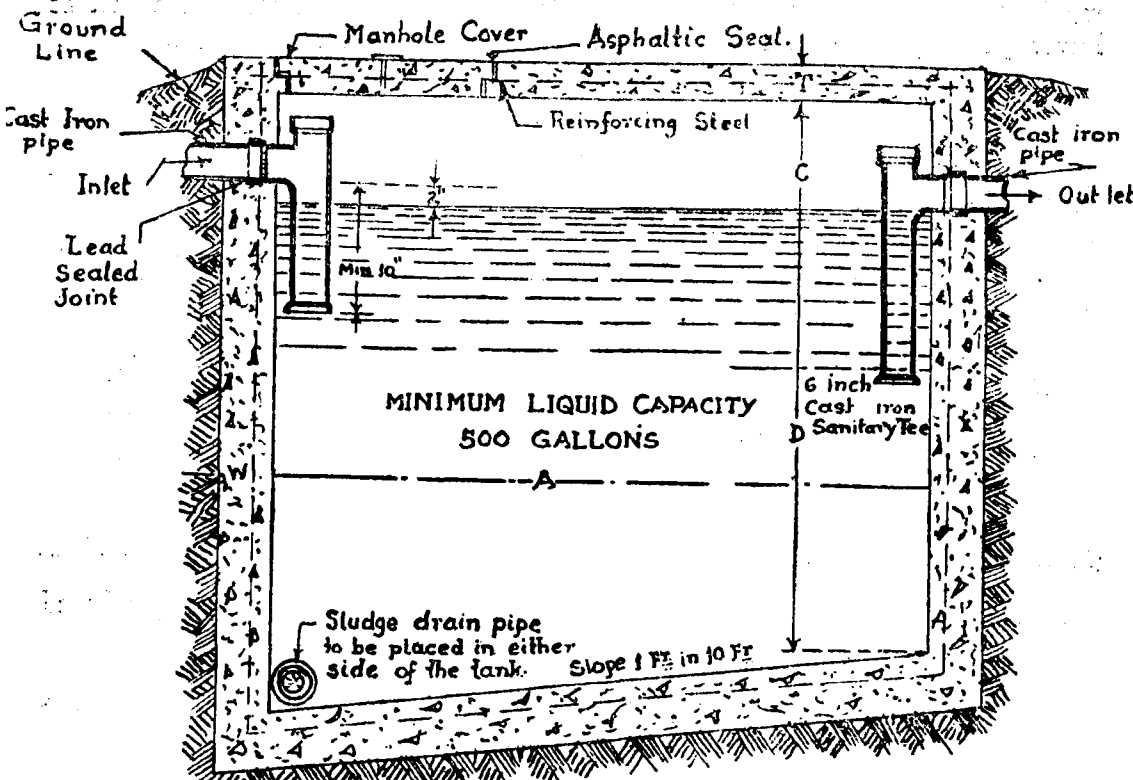
TABLE 1.
Required capacity for septic tanks serving individual dwellings.

Maximum number of persons served.	Nominal liquid capacity of tank in gallons.	Recommended dimensions				Total capacity in Cft.
		Width	Length	Liquid depth	Total depth	
		Ft. In.	Ft. In.	Ft. In.	Ft. In.	
4	500	3-0	6-10	4-0	5-0	100
6	500	3-0	6-10	4-0	5-0	100
8	560	3-3	7-0	4-0	5-0	114
10	700	3-6	8-0	4-0	5-0	140
12	840	3-6	8-6	4-6	5-6	164
14	980	4-0	9-0	4-6	5-6	198
16	1120	4-0	10-0	4-6	5-6	220

(In working out the dimensions from the nominal liquid capacity, the figures have been rounded off.)

The liquid capacities in table 2 are equal to a 24-hour sewage flow without allowance for sludge storage. The omission of allowance for sludge storage is due to the necessity that

the best care and maintenance be given to septic tanks serving schools and camps. The tanks should be cleaned at frequent intervals. This



would ensure that there will be a tank in comparison with those lower per capita solid load in such serving individual dwellings.

TABLE No. 2.

Required capacity for septic tanks serving camps and day schools.

Maximum No. of persons served.		Nominal liquid capacity of tank in gallons.	Recommended dimensions.				
Camps.	Day schools.		Width	Length	Liquid depth	Total depth	Total capacity in Cft.
			Ft. In.	Ft. In.	Ft. In.	Ft. In.	
40	60	600	3-6	8- 0	4-0	5-0	140
80	120	1,200	4-6	10- 9	4-6	5-6	266
120	180	1,800	5-0	11- 6	5-0	6-6	374
160	240	2,400	6-0	12-10	5-0	6-6	500
200	300	3,000	7-0	14- 0	5-0	6-6	637
240	360	3,600	7-0	16- 6	5-0	6-6	761
280	420	4,200	7-6	16- 6	5-6	7-0	866
320	480	4,800	8-0	17- 6	5-6	7-0	980

(In working out the dimensions from nominal liquid capacity, the figures have been rounded off)

Above 4,800 gallons capacity the necessity of a more complete treatment should receive consideration.

tures of a septic tank is reproduced here.

In the next article will be discussed the design of disposal field for a septic tank.

SEPTIC TANK : SANITATION BEYOND SEWER LINES —
THE ENGINEER'S PROBLEM

In the average city of the United States 20—30 per cent of the houses are not connected with a sewerage system and in districts outside the cities the percentage is higher. The design and installation of individual sewage treatment plants for such dwellings should be undertaken by a qualified engineer. The most satisfactory and economical method is the installation of a small septic tank with secondary treatment of the effluent by sub-surface tile drains, sand filters, seepage pits or for larger installations, trickling filters. In a few cases when the soil conditions are favourable cesspools are satisfactory. State or local regulations governing the size of septic tanks must be followed ; usually the minimum capacity for not more than 7 persons is 300 gallons. Simplicity of design is recommended. They should be cylindrical or rectangular at least 30" deep, and made of metal or concrete. Baffles are not necessary if the inlet and outlet pipes are directed upwards. The tank should be placed 10—25 feet from the building with the top 12—18 inches below the surface of the ground. Means of access to the tank should be provided.

(From W.P.R. Vol. XII. No. 5)

HEALTH WORKERS !

FOR YOUR BENEFIT

BY

ONE OF YOU.

[Refer your problems to us. They may be baffling other workers also. We shall help to solve them. If you have solved any of them, let us know. It will benefit others.—Ed., P.H.]

GREETINGS !

This time no problem has been set for us. We shall therefore resume our narrative on Air and Ourselves.

In the previous articles, we noted that air can help or hinder our living in three ways. One is by giving or removing disease producing germs. Another is by regulating our body heat and allowing normal functioning of the body. The third is by furnishing oxygen for breathing out. There is one other way in which air influences our living. That is by permitting or preventing harmful substances acting on or in our body. These substances are usually in the form of dust particles or of fumes or gases. These are added to the air chiefly in factories. So, this function of air is of importance only for industrial workers. The other three functions of air are of importance to the whole humanity wherever they happen to live. In trying to control or regulate our air supply, we have therefore four objects in view, namely :

1. Destruction or removal of disease germs.
2. Maintenance of heat balance.
3. Supply of oxygen and removal of carbon dioxide.
4. Removal of injurious substances.

* * * *

These objects are achieved by proper ventilation of all buildings intended for human occupation. Ventilation means arises whether there are any standards of air supply which will achieve the desired objects.

The investigations of the American Society of Heating and Ventilating Engineers fur-

nishes fundamental data in this respect. The standards recommended by them are summarised in the 1937 issue of the "GUIDE" as follows :

"Section I—AIR TEMPERATURE AND HUMIDITY. The temperature and humidity of the air in such occupied spaces, and in which the only source of contamination is the occupant, shall be maintained at all times during occupancy at an Effective Temperature, as hereinafter stated.

"The relative humidity shall be not less than 30 per cent, nor more than 60 per cent in any case. The Effective Temperature shall range between 64 degrees F. and 69 degrees F. when heating or humidification is required, and between 69 degrees F. and 73 degrees F. when cooling or dehumidification is required. .

"These Effective Temperatures shall be maintained at a level of 36 inches above the floor.

"Section II—AIR QUALITY :—The air in such occupied spaces shall at all times be free from toxic, unhealthful or disagreeable gases and fumes and shall be relatively free from odors and dust.

"In every space coming within the provisions of these requirements and in which the quality of the air is below the standards prescribed by good medical and engineering practices, due to toxic substances, bacteria, dust, excessive temperatures, excessive humidity, objectionable odors, or other similar cases, means for ventilating shall be provided so that the quality of the air shall be raised to these standards.

"Section III—AIR MOTION:—The air in such occupied spaces shall at all times be in constant motion sufficient to maintain a reasonable uniformity of temperature and humidity, but not such as to cause objectionable drafts in any occupied portion of such spaces.

"The air motion in such occupied spaces and in which the only source of contamination is the occupant, shall have a velocity of not more than 50 feet per minute, measured at a height of 36 inches above the floor.

"Section IV—AIR DISTRIBUTION:—The air in all rooms and enclosed spaces shall, under the provisions of these requirements, be distributed with reasonable uniformity, and the variation in the carbon dioxide content of the air shall be taken as a measure of such distribution.

"The air in a space ventilated in accordance with these requirements, and in which the only source of contamination is the occupant shall be distributed and circulated so that the variation in the concentration of carbon dioxide, when measured at a height of 36 inches above the floor, shall not exceed one part in 10,000.

"Section V—AIR QUANTITY:—The quantity of air used to ventilate the given space during occupancy shall always be sufficient to maintain the standards of air temperature, air quality, air motion and air distribution as herein required. Not less than 10 cubic feet per minute per occupant of the total air circulated to meet these requirements shall be taken from an outdoor source."

* * * *

The Health of Munitions Workers' Commission which investigated the subject in England during the recent war practically came to the same conclusions. According to them, the desirable conditions of ventilation are that the air should be:

1. Cool rather than hot.
2. Dry rather than moist.
3. Variable rather than uniform, in temperature.
4. Moving rather than still.

This is an admirable summary and easy to remember and apply in practical ventilation.

* * * *

Wherever man lives and works, he must feel comfortable and remain healthy. It is

for this that we seek to regulate ventilation. In regulating ventilation what we really do is to ensure the supply of a given quantity of fresh air. The ventilation standards noted above must therefore be reduced in terms of the quantities of fresh air needed by man under different conditions. We have already seen that the amount of fresh air alone cannot be the standard. Because too much of air will cause a chilly sensation. Consequently there must be prescribed a minimum space per person as well as minimum amount of fresh air per person per minute. American standards are the following:

MINIMUM VALUES OF OUTDOOR AIR REQUIREMENTS.
(Yoglou et al., 1936).

Type of occupants.	Air Space per person (Cu. Ft.).	Fresh Air Supply Required (Cu. Ft. per Min. per Person).
Sedentary adults of average socio-economic status.	100	25
	200	16
	300	12
	500	7
Labourers	200	23
School children of average class.	100	29
	200	21
	300	17
	500	11
School children of poor class.	200	38
School children of better class.	200	18

Ventilation needs for such places as night-clubs, banquet-halls, theatres, factories and similar places are greater than for places of less congested occupancy or places where there will not be an excessive accumulation of harmful substances. In an ordinary living house about 10 cubic feet of fresh air per person per minute is considered normal; in places like the above, the requirements may amount to 30 or even 50 cubic feet per person per minute.

Corresponding English standards given below show that in many respects the requirements are fixed at the same level in both countries:

	Minimum space (Cu. Feet).
Common Lodging Houses (Sleeping rooms)	400
Non-textile factories (Ordinary).	200
(Overtime).	400
Public Elementary Schools	120

Hospitals are a class by themselves. Persons suffering from several communicable diseases are housed there. The main problem in such cases is the removal of harmful germs which the patients may contribute to the air. More than removal or destruction, the main aim should be to prevent the access of such organisms from one source to another. If this happens, the disease of one patient may pass on to his neighbour in the ward. The occurrence of such cases within the hospital is termed "cross infection". To prevent cross infection, the patients must be as far away from one another as possible. So, the space required is placed as high as 1,200 to 2,000 cubic feet.

* * * *

We shall now proceed to see how ventilation is applied in practice. We speak of ventilation of streets, of inhabited rooms, of schools of factories and mines, and of sewers. In all these cases, ventilation means the same thing. It is the supply of fresh air and removal of vitiated air or its dilution. But the way in which ventilation is effected in each case differs.

The ventilation of streets depends on the width of the streets and the height of the abutting buildings. This is spoken of as "External Ventilation". To ventilate the other places, fresh air must be induced to come in through some openings and foul air must go out through other openings. This twin movement of air is brought about in two ways. In most cases—in one country in almost all cases—we simply provide openings and let the wind do the rest. This may be termed "Natural Ventilation".

One mark of civilization is the growth of industries and buildings where large numbers of people congregate. Such places cannot be

ventilated by natural forces alone. The structure of the building may not permit the location of enough windows. The congregation may be large and the heat generated by them may not be removed by ordinary wind movements of air. In some places injurious substances may be thrown into the air in such large quantities that no natural wind can remove it or even dilute it sufficiently. In all such places, we have to resort to some other means of bringing about a change of air. This is termed "Artificial Ventilation".

We may simply pump out or 'exhaust' the vitiated air from buildings, and let fresh air come in from outside. This is the "Vacuum" or "Exhaust" method. This is specially applicable in the case of factories. Injurious substances are present in the air of factories in large quantities. Their removal is best done by an exhaust. The same exhaust removes also the breathed air. Fresh air comes in through windows. The factories are 'ventilated'.

In cellars, mines, or the holds of ships, we may pump in fresh air from outside and let foul air escape by itself. This is the 'Plenum' or 'Propulsion' method. As these places are not exposed directly to outside air, we have to artificially force in air to 'ventilate' them. If the wind is strong enough it will force in air through an opening. Such openings are called 'cowls'. The air entering the cowl is led into the lower regions by a tube. This method is sometimes made use of to ventilate holds of ships or the ground floor rooms of tall buildings in narrow streets.

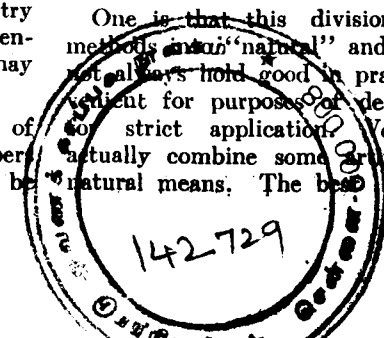
Often buildings are so constructed, or put to such use that exhausting the foul air or pumping in fresh air alone cannot effect sufficient ventilation. Both have to be done simultaneously. We call this "Combined" or "Balanced" system of ventilation.

* * * *

We have to take note of three points at this stage.

One is that this division of ventilation methods into "natural" and "artificial" does not always hold good in practice. It is convenient for purposes of description but not for strict application. Very often, we actually combine some artificial means with natural means. The best instance of such

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combination is the use of the fan with the window. Fresh air comes in through the window. It is does not come fast enough, we feel uncomfortable. Then we use a hand fan or an electric fan. This sets in motion the air inside the room. It may not make more fresh air enter. Yet we feel comfortable. Here we combine natural and artificial methods to ventilate ourselves.

Another is the fact that all means of artificial ventilation are matters of engineering. In fact, ventilation itself is a function of the Public Health Engineer; more so the application of artificial methods. They involve the use of machinery. Its installation and working is complicated. Only a specially trained Engineer can do it. The non-medical or medical health worker has not the training or the capacity for it. Wherever those methods are to be adopted, the problem must be left to the Engineer.

The third is the limitations of these methods. Natural ventilation by open windows is the cheapest and the simplest. It is the method for most buildings. But it may often fail—when the wind is not strong enough or when windows do not face the wind. It will bring in outside dust into the rooms. The exhaust method gets over the first difficulty by ensuring that fresh air will always come in. But it does not prevent dust or fumes coming in. The propulsion method or the combined method has no disadvantage. All artificial methods are costly to instal or maintain. They required expert attention.

* * * *

Natural ventilation is the oldest method known to us. So long as we had only small buildings, so long as we used our buildings for residence or for small gatherings, it was quite easy to provide enough windows and make sure of natural ventilation. As buildings increased in size, as congregations became greater, as buildings were put to other uses, natural ventilation by the open window was found insufficient. Artificial methods had to be resorted to. The New York Commission investigated the relative merits of these two systems in schools. They found that window ventilation permitted lower temperature with comfort, allowed slight variations in move-

ment and temperature of the air, instead of the monotonous uniformity of the artificial system. These features resulted in greater comfort. It also reduced materially the incidence of respiratory disease. The Commission concluded that window ventilation gave as satisfactory, if not better, results as artificial ventilation, and that with less cost and trouble.

This is particularly significant in the case of the ordinary residential house. It is the ventilation of houses that we are most concerned with. In ventilating houses, we want to keep the air inside the rooms cool and in gentle motion. We must maintain "air-freshness" rather than "air-purity". For, the beneficial effects of fresh air are chiefly on the surface of the body and not on the lungs. When cool air moves over the surface of the skin, it not only removes heat but also gives an unceasing flow of sensory impressions. These impressions have a bracing effect and promote physical well-being. Fresh air promotes the vigorous tone of the nervous system; favours circulation of blood; increases oxygen and food intake and metabolism; makes us more vigorous of brain and brawn. Warm foul air on the other hand impedes these physiological processes, relaxes and enervates us, and lowers our efficiency. It is natural ventilation that we get the freshness and other conditions that give this result.

* * * *

Since natural ventilation is better, since it is cheap and since it is applicable to houses with which we are most concerned, we have to discuss it in greater detail. It is the application of these natural methods which will come most often within the purview of the health worker. It is the ventilation of the home which has the greatest effect on man. It is in the house that he spends most of his time.

There is however one method of artificial ventilation which is coming into greater use. It claims all the advantages of the natural system. It is of value in the tropics where cooling is a problem. That is "Air Conditioning". Although this is exclusively the province of the Engineer, we may have to deal with it briefly to understand its principles, uses and limitations.

We shall take up these aspects in our next article.

Pioneers in Public Health

TO OUR YOUNG READERS

LOUIS
PASTEUR



BY

A COMRADE

PIONEERS IN PUBLIC HEALTH

May all be healthy and happy!

Before I begin with the article proper I should like to reply in brief to the numerous letters which I received. I am indeed pleased to note that this section is very popular among the young readers of "People's Health".

Prem Kumar from Lahore has sent this additional information

regarding Harvey. "A statue is erected to his memory on the Leas at Folkestone"—*Thanks, comrade!* G. N. Bose (Calcutta) has written angrily saying that I use too many inverted commas and that the language could be made simpler—I accept your suggestion, angry brother! Messrs. Ramakrishnan (Tinnevely), D. S. Razu (Cocanada) H. Desai (Poona) S. V. Mani (Madras) and Mohamed Syed (Hyderabad) have sent information about Pasteur,—

Search for your information below here, friends!

Numerous others have written congratulating me and the Editor. *Much obliged, dear well-wishers!*

Noble heredity and rich parents are not essential for a man to be great. Indeed it is only a few great persons who can boast of well-to-do families. Let us take an example. Our hero of the month himself Louis Pasteur was born to poor parents . . .

Louis was born on the 27th of December 1822. His father was a soldier under Napoleon but after being 'demobbed' took to tanning, in the village of Dole, where his son was born. When Louis was yet a toddler, the family went to Arbois, another French Village. It was here that Louis was educated at the Primary School. His father loved his Louis dearly and gave him the best education that he could afford. Young Pasteur was not by any means a bright boy at class, though not, a dullard. An excellent teacher at Arbois found traces of greatness in the boy and made arrangements for his going to the normal School (Ecole Normale) at Paris. Accordingly when only 16 years of age Louis was sent with an escort to the capital to study preparatory to the Normal School. Pasteur could not stay long away from his village and his parents and being nervous and excitable he broke down. He would repeat constantly to his friend and escort "If only I could smell the tannery once more, I should feel well".

So he was taken back home and allowed to smell the stench of his beloved tannery! He did get well but

he had to resume his studies. He joined the Royal College at Besancon. His professors were unable to account for the boy's constant use of the microscope and thought it silly that the student should waste his time examining those 'ridiculous' microbes. At last in 1840 he got his B.A. degree. He was appointed as an Assistant Maths. Professor in the College. But he studied side by side and got his B.Sc., in 1842.

Just as Harvey was inspired after hearing Galileo Galilei lecture, Louis Pasteur's mind was also set a-thinking after hearing the great teacher Prof. J. B. A. Dumas speak at the Sorbonne. Finding his interest in Chemistry, Monsieur Balard appointed him as a laboratory assistant, in which capacity Louis could devote much time, to research work. The first problem which Pasteur set out to solve was this—It was known that many substances were found which had the same elements in the same proportions, or to use a big word, were isomeric but nobody could say why they reacted differently to polarized light, as in the case of two specimens of tartaric acids. One specimen possessed the power of being able to turn the ray to the right, whereas the other had no rotary power at all. Pasteur proved that inactivity of one acid was due to the fact that it was composed of two isomeric constituents one the ordinary or dextro-rotary acid and the other a new acid which possessed an equally strong left handed action. This great discovery was not believed at first but when Pasteur demonstrated and proved to the veteran scientist Biot the truth of his discovery, he

immediately came into the limelight. He was appointed the Professor of Chemistry at Stassburg. Here he married Mlle. Laurent who helped him in his work. In 1854 after another influx of popularity he became the Professor of Chemistry and Dean of Lille.

Why is it that beer and milk when exposed to air begin to ferment and become sour? This is a question which strikes us often. Nobody knew why, till Pasteur told them. He examined specimen of sound and unsound beer and came to a conclusion.

He proved that the various changes occurring in the process of fermentation were due to the growth of minute organisms called ferments. "The Chemical Act of Fermentation" writes Pasteur "is essentially a correlative phenomenon of a vital act beginning and ending with it". But regarding the question we have put about why milk and beer ferment when exposed to air, there was a controversy as to whether the microbes that cause the fermentation are ever present in the milk and beer or whether they get into it from the atmosphere. Pasteur conclusively established that the germs get into substances only on exposing to air and that when atmospheric germs are excluded no changes take place. This great discovery was all the more important as it was this, that set the British Surgeon Lister on the way to the discovery of antiseptics.

Not that Pasteur was unopposed, though his greatness was recognised and he was made the chief man in the Academy of Science. Even the great Biot and Prof. Dumas thought

that Louis was wasting his time in unworthy occupations. But Pasteur's motto was "Work, Work always". This motto brought him fame, as we have seen.

In 1865, Pasteur's powers were put to a severe test. Disease attacked the European stocks of Silk worms. The whole of the flourishing silk trade of the country was threatened. The silk producers were non-plussed and were unable to suggest any remedy. The Alais silk manufacturer Dumas urged Pasteur to take up the investigation of the matter. Accordingly Louis went in June to South France to study the position. He had never even seen a silkworm before but undertook the job with a will to succeed. He asked to see a cocoon from which he understood caterpillars were formed. He was given one and on shaking it he found it made a noise. He asked what it was and Fabre, the natural scientist explained to him that it was a chrysalis. From that time Pasteur worked and worked hard on the subject till at last in September he was able to announce the means of immunising from that disease. He stamped out the disease and restored to France the prosperity of her silk industry. "There is no greater charm" says he, "for the investigator to make new discoveries; but his pleasure is heightened when he sees that they have a direct application to practical life". Pasteur next turned his field of activity to the prevention of the infectious diseases. The first disease which he investigated was chicken cholera. This disease killed ten per cent of the French fowls; but after the adoption of Pasteur's

treatment the death rate was reduced to one per cent. Another disease that wrought havoc among livestock was anthrax which devoured a large number of cattle annually. Again, Pasteur showed how this scourge could be successfully combated, and anthrax was almost made extinct. By the adoption of Pasteur's method, many millions of sheep and oxen have been saved every year and the death-rate greatly reduced.

Rabies was a disease which was then greatly prevalent and many thousands of people died as a result of dog-bites in all countries. Pasteur, after studying the disease in dogs came to the conclusion that virus had its seat in the nerve centres and that the virus from a mad dog, when injected into the body of healthy one produced the disease. After long labour, he found that the virus could be weakened and used as an anti-toxin. But would the inoculation of the weakened virus have any effect on an animal already stricken? This was another obstacle which stood in the way of Pasteur attaining his object of wiping out rabies. Here again his experiment was successful. But treating human beings was different from treating dogs; nevertheless Pasteur tried and was victorious. On the 14th November, 1888 a Pasteur Institute was founded and thousands of people suffering from dog-bites from all over the world were treated and the death-rate fell considerably. This *magnum opus* of Pasteur's numerous discoveries won him the gratitude of all the people of the earth.

Partial sterilization of milk which is now widely practised all over the

world, was yet another invention of our hero and the name "pasteurisation" given to the process is after him.

It would be interesting to note that Pasteur who stands almost unrivalled in the field of chemistry had a note attached to his diploma that he was only "mediocre" in chemistry? One need not necessarily be brilliant to achieve greatness. Even 'medrocrities' can rise to eminence by sheer hard work and application. Throughout his life, work was Pasteur's constant inspiration. "Rich in years and in honours but simple-minded and affectionate as a child, this great benefactor to the species" passed away quietly near St. Cloud on the 28th of September 1895 at the age of 73, though Pasteur Institutes all over the world carry on the work of this great man to this day.

* * * *

So, Comrades, are you now convinced that even the son of a poor tanner could rise to eternal eminence envied by one and all. You now know about an Englishman who was the Father of Modern Physiology, and a Frenchman who has saved many millions of people and many more millions of cattle by his discoveries. Next month I shall tell you about another great man, this time a German—Robert Koch. I repeat my appeal to you to search for information about these people. I have exceeded my limit this time, so Comrades, Cheerio till next month.

Your Loving Comrade,
BROTHER MOHAN.

* * * *

READERS' FORUM

This section is open to readers for their frank, free and fearless expression of views on all aspects of people's health.

Type-written letters facilitate work.

Rationing of paper restricts space. Brevity is the soul of wit.

Please remember that "People's Health" is above communal, party or personal politics. (Ed., P.H.)

ADULTERATION OF FOODSTUFF

RAO BAHADUR T. S. RADHAKRISHNA IYER

Indian Audit and Account Service (Retd.), writes:

SOMETIME last year, it was brought to my notice that the ghee sold by the cowherds and other ghee vendors in my village, emitted a bad smell after it had been kept in stock for two or three days. It was suspected that animal fat and vegetable ghee were mixed with the genuine article. As the admixture of these substances is considered to be deleterious to the health of the consumers, I made a request to the District Health Officer to take some samples of the ghee stocked for sale to the public and have them analysed to find out what they contained and to take necessary action under the Public Health Act, if they were found to have been adulterated with injurious substances unsuitable for human consumption. I got a reply that the Madras Prevention of Adulteration Act was not in force in my village and that no sample could therefore be taken and sent for analysis. It was also explained to me personally that an extension of the Act to this village was not possible, as its population did not exceed 10,000 inhabitants. Even in bigger places where the Act has been made applicable, it is doubtful whether there are sufficient number of employees in the Health Department to check the quality of the food-stuffs sold to the public, to take out samples of suspected articles and send them for analysis to the Central Laboratory. I would appeal to the Ministry of Food and Health to look into this matter and enact early the necessary legislative measures to ensure the prevention of adulteration of articles of food with harmful substances, wherever they may be sold to the public.

On the face of it, the term 'adulteration of food stuff' gives an

impression as though the consumers of such adulterated food stuff are exposed to the risk of jeopardising their health. Unless poisonous or injurious substances are added to food stuff, there can be obviously no danger to the health of the consumer. Rarely, adulteration is deliberately practised by adding *poisonous or injurious substances*. How far ghee adulterated with animal or vegetable fat affects its nutritive value is a point on which an authoritative expert opinion is called for. This subject had been agitating the public mind for quite a long time. But no authoritative statements by our nutrition experts have been issued on the question. There are two nutrition experts under the Government of Madras. Other administrations also should have their own nutrition experts. In Madras one expert is under the Food Department and the other under the Public Health Department. There is a general feeling that the appointment of 'experts' in charge of a specific work does not usually result in the common man deriving any benefit of the expert's advice. This impression should be removed. How

far adulteration of food stuff generally with non-injurious extraneous inert substances affect the nutrition value, should be investigated and the benefit of such investigations should be made public.

If milk is adulterated with water, the consumer's health is not ordinarily exposed to risks of ill-health, as milk as a rule, is boiled in our country before consumption. But adulteration of milk has this effect. If, say, eight ounces of milk is considered the optimum quantity to be consumed by an individual to maintain normal health, the consumption of that quantity of adulterated milk cannot give the expected result. Further why, should a person pay for a spurious stuff as much he should for a genuine one?

Many Panchayat in the Madras Presidency have applied and are still applying for the extension of the Food Adulteration Act to their local areas. These applications are being turned down on the ground that there is not adequate laboratory facility for analysing the samples. There is but one central laboratory at the King Institute, Guindy, for analysing the samples. The accommodation and the organization in that Institute are deplorably inadequate to meet the demand even from the area where the Food Adulteration Act is in force now. According to the Annual Report of the Director of Public Health, the Act was in force in 224 local areas—Municipalities and Panchayats—at the end of 1945. The number of samples received from these areas ought to be infinitely more than what is actually received, at pre-

sent, if the administration of the Act should result in achieving the aims in view. To ensure efficient work, even so far as these areas are concerned, it is imperatively necessary that the laboratory facilities should be extended forthwith. The routine work involved in analysing and certifying samples is so heavy that one is amazed that the organization is functioning at all. We would suggest to the Minister of Health to pay a *surprise* visit to the laboratory to satisfy himself of the appalling conditions in which the laboratory functions. The staff should be strengthened straight-away, if efficient work is expected here.

If the Act is extended to other local areas, it would naturally involve additional work. It is futile to expect the central laboratory at Guindy to cope with any additional work. It is also undesirable to transport samples taken from the remotest corner of the Province to the central laboratory at Guindy. What then should be done? The Municipal laboratories wherever they exist at present, as in Madura, should be utilized for analysing samples of suspected, adulterated food stuff. The Municipal Health Officers of these stations can be expected to have a supervisory control over the work. The hygiene laboratories attached to our Medical Colleges should be similarly utilized for the purpose. Perhaps, it may be necessary that analysts should be appointed for the purpose. The committee appointed by the Central Advisory Board of Health has considered that a medical qualification

is not necessary for this work. The Government Analyst at Guindy can be expected to give suitable guidance to the recruits.

We may draw attention to an article by Dr. S. V. Ananthakrishnan on "The Prevention and Control of Food Adulteration" which appeared in our issue of December, 1946, (pp. 147-149). The author has put forward definite and constructive proposals for utilizing the laboratories attached to the Colleges in the mofussal stations. His suggestions deserve consideration at the hands of the authorities.

Finance has always been the stumbling block to progress. Finance has become a professional objector to any proposal to improve matters. It is fast winning a notoriety. It cannot be contended that the Food Adulteration Act was enacted with a view to adding funds to the coffers of the State or of the local authorities. The Act is intended to render a public service. Whatever money is realized in the administration of the Act can be spent without demur in achieving the objects of the Act. Ninety per cent of the fines realized goes to the local authority concerned and ten per cent to the State. The State normally realizes about two lakhs of rupees per year.

Our Magistrates sometimes develop a kind of sympathy for the accused. They let them off in many cases with nominal fines. They do not seem to realize that it costs as much as Rs. 15 as a minimum to collect a sample, transport it to the laboratory and to have it analysed there before getting

a certificate from the analyst. The volume of the trade and the illegal profit accruing from adulteration should be taken into account. The fine imposed on the guilty should cover the cost and at the same time deter the accused from seeking again illegal profits by adulteration. The Special Committee appointed by the Central Advisory Board of Health state:

"Directors of Public Health were asked for their opinions regarding the sufficiency of the fines imposed and their effect in checking fraudulent vendors. The general reply is to the effect that the fines imposed are not sufficiently heavy to make adulteration of food unprofitable for dishonest vendors. The committee were informed that in Madras the fines for milk adulteration are particularly unsatisfactory, and it is difficult to make magistrates realize that, though milk vendors are usually drawn from the poorer classes, the illegal profit even from moderate adulteration of the milk of a single cow more than covers a fine of Rs. 20 or Rs. 80 within a short period of time." The Government should take immediate steps either to amend the Act in regard to penalties or issue an executive directive to all magistrates that a basic fine of Rs. 15 should be imposed and additional fines fixed in accordance with the gravity of the offence.

Drastic amendment to the Act is long overdue. Minor amendments have been carried out now and then. What is required is to recast the Act

completely in the light of the experience gained so far. The Minister of Health would do well to devote some attention to this subject.

The number of prosecutions under the Act is ridiculously small as compared with the magnitude of the trade. Experience shows that over 50 per cent of the number of samples analysed are found grossly adulterated; whereas in other countries, the percentage of adulteration rarely exceeds 2 per cent of the samples taken on suspicion. This shows that the number of samples taken here is ridiculously low. Unless more samples are taken and more prosecutions are successfully launched and more deterrent punishment is given to the guilty, the evil practice of adulterating food cannot be put down effectively.

By a curious irony of fate the Surgeon-General is the controlling authority over the staff employed in the analysis of samples of food. The officers of the Health Department in the field collect the samples, conduct the prosecutions and generally bear the brunt of it all. The proper authority who should be charged with the entire responsibility is the Director of Public Health. Dyarchy might have suited the policy of divide and rule but dyarchy in the administration of the Food Adulteration Act would prove disastrous. Our administrators have a knack of calling upon cobblers to make for them dress suits! How then, can they justify medical men being entrusted with ceremony, for example? The Minister of Health would do well to transfer the Government Analyst and all those

employed in analysing and certifying samples to the control of the Director of Public Health. There is no good of talking glibly that the necessary co-ordination is being obtained between the medical-curative and medical-preventive departments by occasionally consulting the Surgeon-General in matters about which he knows next to nothing. We shall have of course, many more occasions to add to the instances to show that co-ordination between these two branches exists only in the imagination of the authorities but not in reality.

We have been compelled to add to the letter of our esteemed correspondent this long note as the subject had not received the attention it deserves at the hands of the authorities. As the food supply becomes precarious, adulteration of food becomes more rampant. The popular Ministers of Health would be rendering a service to the people if they take effective measures to root out adulteration of food. The rich and the influential always secure the best and the genuine food stuff, whatever be the market conditions. They secure the best at a price perhaps below the market rate. But it is only the common man who is hit hard by the adulteration of food for the purchase of which he has to find funds by the sweat of his brow.

(Ed., P.H.)

(We are compelled for want of space, to hold back other letters to the Editor from our readers. We request our friends to pardon us. We shall endeavour to publish them in our next issue.—Ed., P.H.)

LAW AND PEOPLE'S HEALTH

LEGAL DECISIONS RELATING TO DISTRIBUTION OF PUBLIC WATER SUPPLIES

BY

FRANK A. MARSTON,
Partner, Metcalfe & Eddy,
Boston, Mass.

(continued from page 487; May, 1947)

Lack of Water Pressure or Lack of Water.—

There have been cases involving alleged damage due to the failure of the water authority to furnish water under adequate pressure or due to furnishing water at a pressure far below the normal. The following typical cases indicate the decisions made by the courts relative to responsibility for such damage.

In a Connecticut case, the court ruled that a property owner had no claim against a water company for failure to conform to its contract with a municipality to supply fire hydrants with water (25). In Kentucky, on the other hand, a water company was held not to be relieved from liability for fire loss caused by frozen hydrants on the ground that freezing of hydrants was an act of God (26).

In Arizona, the court found a water company not liable because of failure to provide sufficient pressure in its mains (27). Similarly, the higher court held a water company not liable, for not supplying sufficient water for fire protection, in compliance with the provisions of its franchise (28).

In 1908 a conflagration occurred in Tampa, Fla., which burned a large section of the city, and suits were filed against the Tampa Water Works Co. aggregating about 1,250,000 dolls. In one case the higher court ruled that plaintiff's property was not located where the fire started, that defendant was not responsible for starting the fire nor under duty to extinguish the fire, and that defendant did not fail to supply water as legally required (29).

The responsibility of a water company for fire protection was established in Kentucky by the Paducah case (30). Here the court held that the water company did not maintain its contractual obligations, because it did not furnish an adequate quantity of water

for extinguishing the fire, and was therefore subject to damage for fire losses.

The North Carolina courts followed the Kentucky court in finding that a water company is liable to an owner of property destroyed by fire in case of failure to supply water and pressure at the time of the fire (31). In this case the plaintiff sued as a beneficiary of the contract between the city and the company.

In Tampa, Fla., fire caused by explosion of a gasoline lighting system destroyed one building and damaged goods in the next building. The owner of the building in which the fire started brought suit against the water company, on the ground that the company did not furnish sufficient water to put out the fire (32). The court held that the defendant assumed a "public duty of furnishing water for extinguishing fires according to the terms of its contract" and, for negligence in discharge of that duty, was liable in an action of tort.

Kentucky, North Carolina and Florida, appear to be the only states which have held water companies liable to individuals and tax-payers for contracts made with the city for furnishing water for fire protection.

As typical of the many similar cases in which water companies have been held not liable, the Shreveport, La., case may be cited (33). Here the language of the court was as follows: "It goes without saying that no contractor would expose himself to a law suit in the wake of every fire, without exacting pay for so doing, and the pay would have to be very heavy, for.....at any moment under such a liability, heavy damages might have to be paid, in fact a general conflagration.....might utterly bankrupt the contractor. It is entirely improbable that the city of Shreveport would have been willing to impose so heavy a burden upon her treasury."

Construction methods contrary to accepted procedures.—

In case damage results from the use of construction methods other than those generally accepted, the water authority might be held liable, if the method used was enough different from the recognized methods to involve negligence, rather than a mere error in judgment.

Evidence of unstable soil, which should be expected to cause settlement and for which no provision was made, may be a basis for negligence, as in a Minnesota case (34).

Samuel J. Manning was asphyxiated on August 22, 1913, while asleep in his home in St. Paul, Minn. Immediate investigation by the gas company showed a large break in the service pipe at a joint or coupling in the ground, 5 ft. away from where it passed through the foundation of the building. The pipe which was 27 in. below the surface in peaty ground, had not been disturbed since Mr. Manning became owner of the house, about four years prior to his death. The complaint alleged negligence, in allowing the pipe to become damaged, defective and leaky. The higher court, finding against the defendant, spoke as follows:

"We think the evidence amply justifies the verdict. The character of the soil around Manning's home was such that it was liable to settle, yet the usual precaution to block the service pipe at the coupling or joint was not taken. That settling was considerable was shown by the fact that the sag of the pipe at the break was six inches. The soil was also of such character that the action of the frost was likely to heave or unsettle it to a great extent, and yet the pipe was placed at a depth of less than three feet. The evidence also tended to show no attempt in the original installation to plaster or make tight the foundation where the pipe passed through; thus a ready access to the basement was afforded the escaping gas."

Improper replacing of earth back fill in a street excavation was found to be a basis for negligence in a Pennsylvania case (35). Furthermore, the fact that a permit, granted to a water company to do work in a street, provided for a deposit by the company to be held for a certain time was found by the court not to warrant the inference that return of the deposit released the water company from

liability for damages caused by the negligent replacement of dirt.

According to the decision in a New York case, in order to hold the water authority liable for damage due to improper laying of a pipe, negligence must be proven (36). In this case, an ice company brought suit against a water company, alleging an improperly laid water main, which finally broke, causing damage to the interior of the ice plant. The higher court held the water company not liable because the ice company failed to prove that the break occurred because of negligence.

Carelessness During Construction:

According to several court decisions, the water authority may be deemed negligent for careless work during the construction. A meter pit left uncovered by workmen may cause injuries for which the water authority is liable as in a New Jersey case (37). Injuries to workmen and to the public during the progress of construction work may involve the liability of the water authority, as in the case of other construction work.

In California, suit was brought against a contractor and a water district, which employed the contractor to construct a water tunnel, by a personal representative of one of the contractor's employees who was killed during the construction work (38). The court held that the water district was engaged in a proprietary and not a governmental function in constructing its water system and was accordingly liable in damages.

In another case, the same water district was held liable in damages for the loss of an eye of a passer by, when a piece of steel broke off a tool, which was being used by employees of the water district in connecting a water main in a city street, flew up and hit the passerby (39).

Negligence in Operation and Maintenance.—

Many cases have been brought before the courts in which damages were claimed due to negligence in operating and maintaining water works. Some typical cases in this category are given below. Among them are a few involving damage due to breakage in pipes, where it was brought out that diligence was not shown in shutting off the flow of water or in repairing a leak.

In one case, in the south western part of the country, the higher court held that it

must be proved whose duty it is to maintain a certain structure, the failure of which has caused damage, even though there may have been negligence (40). Specifically, the court refused to hold a water company liable for destruction by fire, although negligence in keeping the fire plugs in proper condition was proved. There was no evidence as to whose duty it was to keep the plugs in condition.

In New Jersey, a water company was held not liable for the burglarizing of a vacant house from which it had removed a water meter, since it had subsequently closed the house, as effectively as it had previously been closed (41). In Louisiana, a city supplying water was held not liable for a death by drowning in an excavation which had been made to repair a leak, since there was no reason to anticipate the death (42).

In the case of a Colorado public service company, which maintained a pipe line on a mountain side in a known slide area, the court held that greater care may be required in the maintenance of such a pipe than of a ditch in the plains (43). In Utah, moreover, a court held a city liable for damage to property which resulted from a land-slide due to natural causes, on the ground that an improperly maintained pipe line contributed to damage (44).

In a case where it was shown that a meter-box cover had been removed, causing a citizen to fall by stepping into the open hole, the city was held liable, because the citizen was not negligent and did not know of the specific defect which caused the fall. The court ruled that, where a sidewalk is defective and a pedestrian admits knowledge of its condition, recovery cannot be made, but that, where a pedestrian is unaware of the specific defect, he can recover (45).

In 1919, a damage suit in New York resulted from a break caused by the pressure of Catskill water upon an old main, which had been laid 47 years before (46). The original pressure was 25 lb. per sq. in. Where the pressure was increased by 10 lb. per sq. in., two breaks occurred in pipes in the neighbourhood. Then when the pressure was increased by an additional 10 lb. per sq. in., the break which brought about the litigation occurred. In the words of the court, "here no question of notice or knowledge is involved, it being apparent that all the facts were known to, and the situation perfectly realized by, the appropriate city

authorities." The city was consequently held liable for damages.

In a suit brought by a Virginia city, the defendant, owner of a warehouse which was flooded, was found not guilty of contributory negligence, when city employees closed the wrong valve leading to a sprinkler system (47).

Courts have ruled in numerous cases that, upon being notified of the existence of a leak or a break in a pipe, or the occurrence of a similar accident, the water authority is bound to use diligence in stopping the flow of water and in repairing the faulty pipe or appurtenance. Failure to do so may result in liability for damages resulting from the delay.

In a Massachusetts property owner's action for damages on account of a city's alleged negligent operation of water works, which caused flooding of a cellar, the evidence was held to sustain a finding that the city was negligent (48). The plaintiff owned a 42-family apartment building on Hanover Street in Boston. In 1932, five buildings in the rear of the building were torn down. While the last of these was being torn down, 1 ft. of water came into plaintiff's cellar, through the rear wall. Plaintiff brought the matter to the attention of the water department at once, but it was not until November, 1933, that the city repaired the broken water pipe.

In California, a water company was held liable for injuries due to a gas explosion which was caused by a street cave-in, resulting from a water pipe break (49). The jury found negligence in failing to repair the main or shut off the water promptly.

In a Kentucky case, the court ruled that a city supplying water is bound to use ordinary care to maintain its mains and pipes in proper condition and persons using water must use ordinary care to maintain in proper condition the pipes and fixtures upon their own property (50). Where a user's negligence concurs with that of the city in flooding his premises, he is not entitled to recover. On the other hand, where a municipality, after due notice that plaintiff's premises are being flooded by a leak from a pipe connecting with the city mains, fails to use ordinary care to turn off the water and avert the damage, plaintiff can recover under the doctrine of the "last clear chance," even though the leak was caused by his own negligence.

Hazardous Conditions on Users' Premises.—

Water departments or companies are responsible for the quality of water received by their customers. That this responsibility may include the quality of water on the consumers' premises after passage through the service pipe is indicated in court decisions rendered during 1938 and 1939 (51, 52). Under some conditions the water authority may be responsible for damage caused by faulty service appliances.

There are several ways in which water may become contaminated after it leaves the street main and before it is drawn from a tap on a customer's premises. Certain conditions may be dangerous to the public without affecting the city-wide quality of the water. Some of these hazardous conditions are as follows:

1. Character of material in service pipe may affect quality of water, causing water to become injurious to health.
2. Service pipe may be contaminated during laying, with the result that water passing through may contain harmful bacteria.
3. Poorly constructed water piping on the premises with resulting leaks, may provide opportunity for pollution to enter the water pipe from the outside, at times of negative pressure in the pipe.
4. Faulty flush-tank connections in hot and cold water systems may permit back-siphonage of contaminated water at times of negative pressure in the water pipe.
5. Improperly built water closets and supply faucets located below the maximum water level in bath tubs may be the source of pollution in the water pipe, due to back-siphonage.
6. Cross connections between the public water-supply system and piping containing an impure water may cause contamination of the public supply and injury or death to persons drinking the water.
7. Plumbing systems may be poorly constructed or soil pipes may be so located that in case of leakage open water tanks may receive pollution.
8. The reduction of pressure in a water main during a fire, when drafts are heavy, or at the time of a break in the main, may produce negative pressure in the water pipes with consequent collapse of hot-water boilers and withdrawal of water from heating boilers,

later resulting in dangerous conditions and possible damage to life and property.

9. Improperly located service, pipe, curb boxes, or other appliances may be a source of danger to the travelling public.

10. Leaks in service pipes may result either directly or indirectly in damage to persons or property.

In an English case, a man and his wife claimed damages for personal injuries due to lead poisoning contracted by drinking water supplied by the Irwell Valley Water Board (53). The water was not of dangerous quality in the main but was rendered so after passage through a lead service pipe. The higher court pointed out that the water board had been warned over and over again that water from a moorland source was likely to be dangerous if passed through lead pipes, and that the board had a duty to supply water of such a character that it would be fit for domestic use. The court held that the water board might have corrected the solvent action of the water, or the water consumers might have been warned to put in a different kind of pipe or to draw off a sufficient quantity of water before using. In spite of complaints of illness due to lead poisoning, there was a long delay on the part of the water board, and this seems to have contributed to the negligence. Judgment was entered for the plaintiffs in the amount of £873 with costs.

In a recent Massachusetts case, the plaintiff Horton, claimed damages for lead poisoning due to drinking water furnished by the town (54). Water supplying the plaintiff's house passed through 172 ft. of lead pipe between the water main and the meter. The water contained carbon dioxide to the extent of 30 p. p. m., and water standing overnight in the service pipe showed more than 8 p. p. m. of lead. The state Supreme Court held that the town was liable on an implied warranty that the water was fit to be passed through the service pipe, approved by the town's agent, and then used in the house; and that the town was negligent in not taking reasonable steps, according to available knowledge, to correct the quality of the water.

In a case where it was shown that a Connecticut city failed to repair a broken service pipe, which flooded the cellar of a property owner, the higher court held the city liable, since upon notification of an imperfection in the equipment affecting a property owner's

premises, it was the city's duty to use ordinary and reasonable care to make the necessary corrections (55). In another case where a service connection was installed by a water company; some years afterwards, when the pipe became rusty and caused damage, the company was held liable, in view of its contractual relations with the property owner, and in spite of the fact that the property owner had never paid his portion of the cost of the installation (56).

In Illinois, however, the court has held that a water company is not liable for maintenance of pipes and accessories belonging to the property owner (57). Similarly, in another case, where a property owner stumbled over a valve box on his own property, it was found he should be responsible for all repairs necessary from the main to the meter (58). Moreover, in a Montana suit concerning liability for injuries, due to failure to repair a pipe, it was decided that the property owner owns the water pipe and fixtures to the line between the lot and the street or alley, and the water company owns the pipe and fixtures beyond such line (59).

In main, a consumer's failure to have a check valve installed was held negligence preventing recovery, where a water tank collapsed when the water company shut off the water in the main (60). The water company's failure to inspect the consumer's appliance was not a waiver of the rule requiring the consumer to have a check valve between the water tank and the street main.

In New Hampshire, a water company, maintaining a hole in a cellar for a meter and using a cover constructed by someone else, was held responsible for discoverable structural defects therein (61). Knowledge, chargeable to meter readers, of a defective cover over the hole containing the meter was held to be knowledge of the water company.

Briefly summarized, water purveyors have generally been held liable for damages resulting from the construction or operation of water distribution systems only where negligence has been proven. Knowledge of leading court opinions in these cases will aid water works operators in conducting the business so as to prevent conditions that may cause damage, as well as to provide defence against unjust claims.

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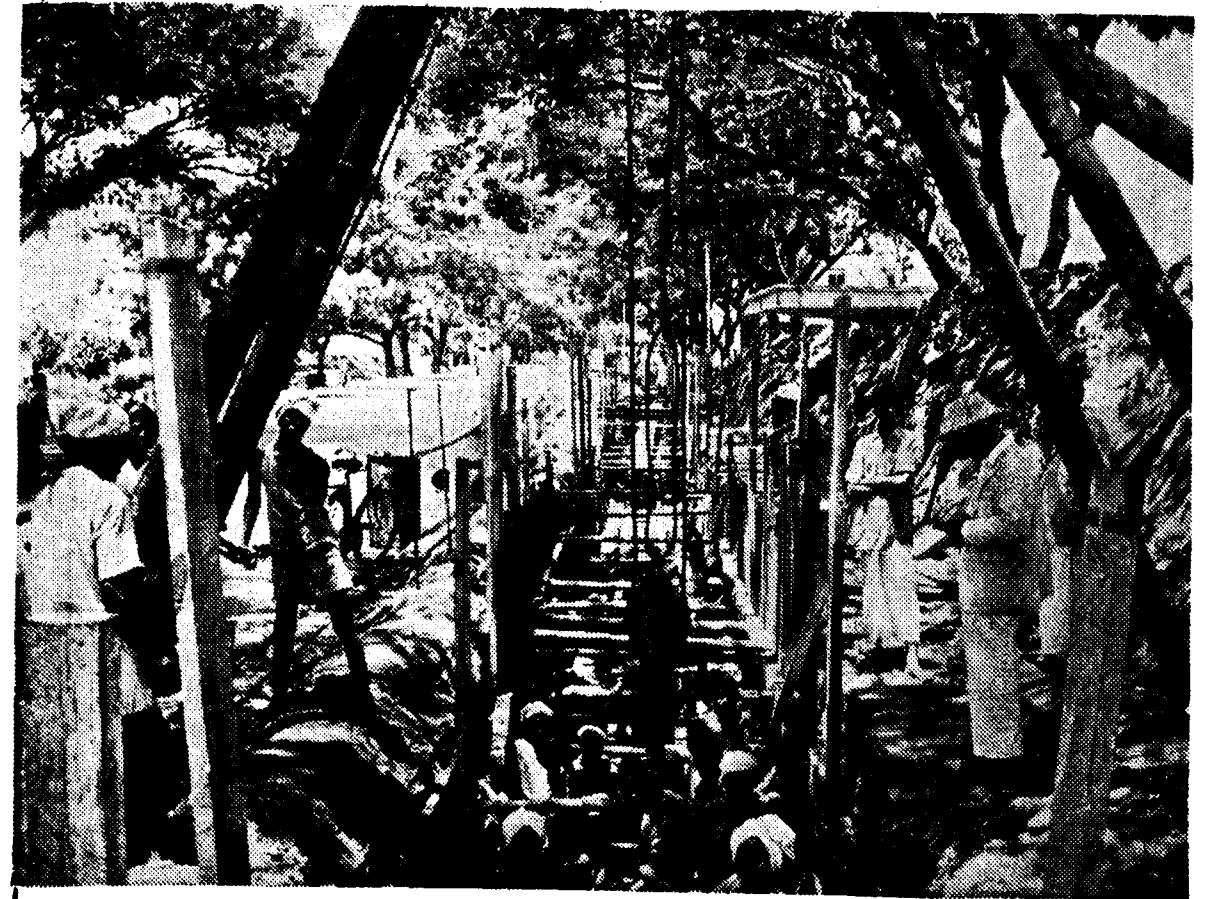
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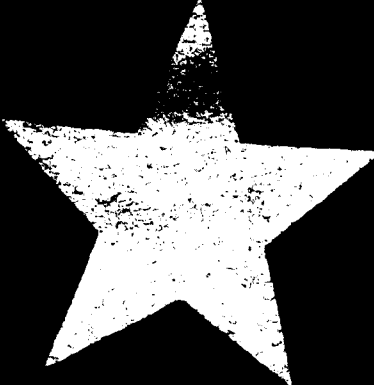
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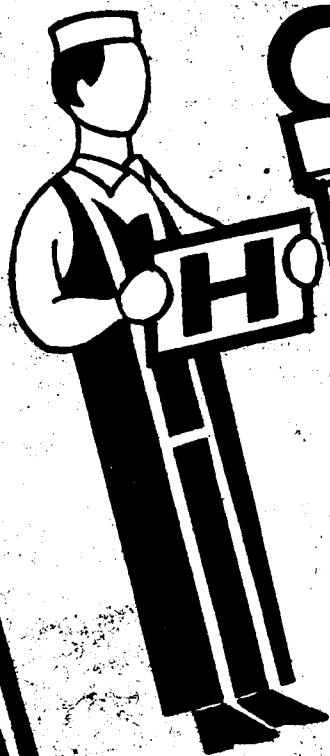
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