Swasth Hind

NATIONAL CLEANLINESS DAY NUMBER

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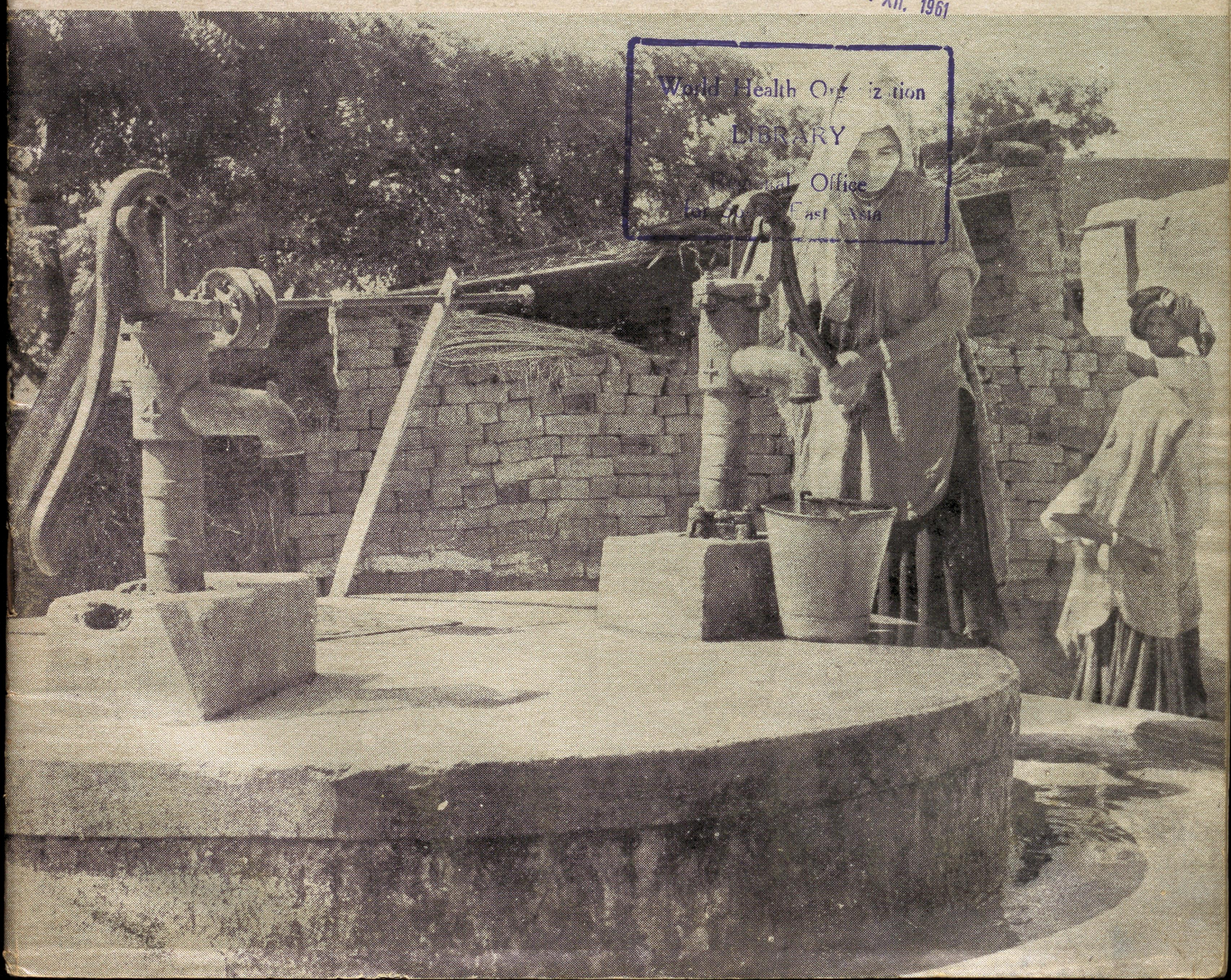

PHOTO ON COVER

Our endeavour should be to take all possible precautions to prevent the contamination of water by surface seepages, which carry objectionable materials that cause dread diseases like cholera, typhoid and dysentery. The picture on the cover shows a safe water supply in the rural area—a village woman drawing water from hand-pump fitted in a sanitary well

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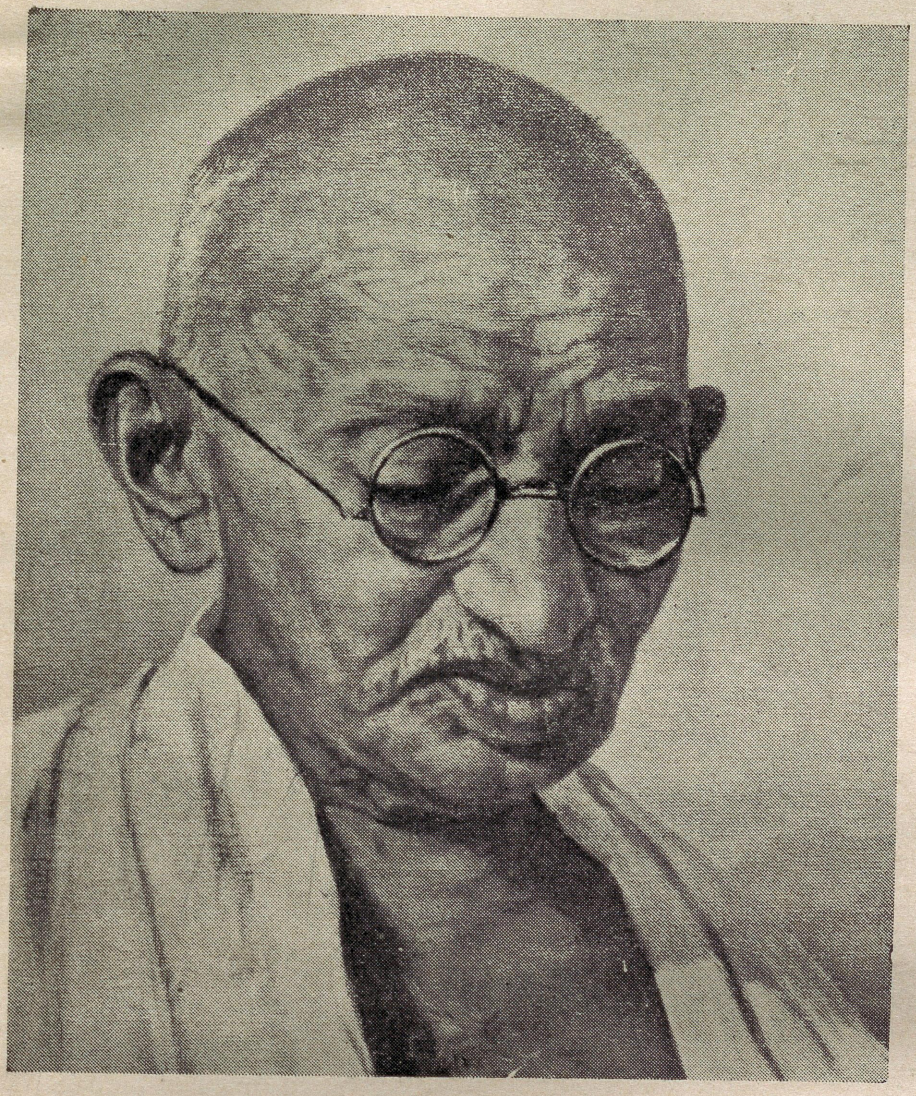

Village sanitation is the State's responsibility.
The villagers must work for it, if the State does not.
Municipality means village service society, such a society can be formed by villagers themselves.
Cleanliness costs nothing, when volunteers work.
In small villages, even a few altruistic youngmen can undertake village cleanliness work.

—MAHATMA GANDHI

Union Health Minister's Message

CLEANLINESS is a prime requisite for healthful living—cleanliness of body, clothes, food, dwelling and environment. The progress of a country ultimately depends on the health of her people. It is, indeed, appropriate that we are observing the National Cleanliness Day on October 2, the birth anniversary of Mahatma Gandhi, who embodied in himself the ancient ideal of a sound mind in a sound body.

Gandhiji preached as well as practised the tenet that cleanliness comes first. It was his strong conviction that for the amelioration of the masses, India's villages should first be rid of filth and disease. Every year, millions of people die of cholera, typhoid, dysentery, jaundice and other diseases which are spread through contaminated food and water. On this National Cleanliness Day, we should resolve to work for the supply of safe and wholesome water. This can be done by cleaning up and improving the wells that already exist and by sinking new wells of proper construction. Let us also make it a point to see that water is always boiled and cooled before drinking.

Then again, since typhoid fever, cholera, diarrhoea and the dysenteries are transmitted by human discharges, it is essential that all human excreta are disposed of underground in a manner that does not attract flies and by constructing

sanitary latrines. Indiscriminate defecation and the habit of spitting wherever one pleases should be stopped.

There are other essential things to do also, such as cleaning of streets and other approaches to villages, attending to the drainage of the villages and houses, and preventing fly-breeding by disposal of dung and rubbish in sanitary manure pits, etc. In urban areas also, people should undertake activities similar to those planned by villagers.

Sanitation is a way of life. Being a way of life it should come from within the people. It should be a cooperative effort. It is not a matter for a day. It should be a life-long observance.

I hope the National Cleanliness Day will succeed in focussing the attention of the people on these ideals of cleanliness and sanitation.

D.P. Karmarkar

(D.P. Karmarkar)

National Cleanliness Day

Dr Rajendra Prasad, President of India, says :

".....Public health and cleanliness are so closely connected that it is impossible to think of one without the other. Insofar as it would focus public attention on keeping public places like parks, monuments and places of common interest tidy, I hope it will inculcate among our people the necessary sense of cleanliness and subsequently lead to better health...."

Shri Jawaharlal Nehru, Prime Minister of India, says :

".....The idea is good....."

Shri D.P. Karmarkar, Union Minister for Health, says :

".....Cleanliness has to be cultivated not only for one's own sake but for the sake of others. A civic responsibility is cast on everyone to keep oneself and one's surroundings clean. In this common community effort to keep off dirt and disease, every man, woman and child has a stake. For millions of lives are served by ensuring and improving environmental hygiene....."

Shri M.S. Abdul Khader, Mayor of Madras Corporation, says :

"....Without the cooperation of the people, whatever the Corporation does will be ineffective and all the improvements and plans made by the authorities will be rendered useless. I strongly feel that the civic associations and the public-spirited citizens can help by carrying on an intensive propaganda amongst masses in their own sphere and raise the standard of cleanliness. If this is done, the habits and conditions of living of the masses will improve considerably....."

Shri Mange Ram, a Village Leader, says :

"....The constructive programme of cleanliness work will not cease after Gandhi Jayanti or Cleanliness Day, but will continue all the year round...."

Shri Bakhtawar Mal, a Village Panch, says :

"....We are trying to put into practice Gandhiji's ideals on cleanliness. We will do our best in making our village clean and free from disease....."

PROBLEMS IN ENVIRONMENTAL SANITATION

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ENVIRONMENTAL sanitation occupies an importan place among the nation-building programmes. Its public health significance is universally recognised, but its direct and indirect impact on the socio-economic development of the country is not yet fully appreciated. It permeates, in fact, into every field of human activity and the health and happiness of the people depend on a successful solution of the problem. Due to various reasons the environmental sanitation problems in our country have assumed a colossal magnitude demanding urgent action. But with the limited resources available, priority has to be given to the basic and most urgent of the environmental sanitation problems. Recognising this, the National Water Supply and Sanitation Programme was inaugurated in August/September, 1954 to assist the States in providing water supply and sanitation facilities in the urban and rural areas under a planned programme of development. As a result of this programme, during the past seven years significant improvement in the situation has taken place. But the magnitude of the problem lying ahead is so vast that it dwarfs the achievement. The ways and means of accelerating the pace of progress of this programme based on a realistic assessment of the problems has been the principal subject of study by a number of expert committees that have recently gone into this question. A rough assessment of the problems has been made and a number of suggestions have been offered. It is generally agreed that the essential amenities of water supply and sewerage should be available in all our urban areas within the next 15 to 20 years and that minimum facilities in the field of water supply and sanitation should be available in all our rural areas within the next five to ten years.

In promoting a programme of this vast magnitude, public support, understanding and appreciation of the problems involved are very essential.

It is in the fitness of things that the special issue of the *Swasth Hind* to mark the National Cleanliness Day on 2nd October is devoted to articles on water supply and sanitation contributed by the Central Public Health Engineering Organization.

An attempt has been made in this issue to discuss problems of topical interest bearing on the different aspects of this major subject. Emphasis has been laid on problems of the rural areas. The supreme role of environmental sanitation in the war against disease has been brought out. Problems relating to development of water supplies in urban and rural areas, urban and rural sanitation, and the importance of efficient maintenance of the facilities provided have been briefly discussed, highlighting their impact on the common man. The achievements under the Five Year Plans and the size of the future programme have been brought out. The relative role of the health and engineering personnel in implementing the programme has also been discussed. In the future implementation of these programmes, it is an understanding of the methods of financing that holds the key to solution of these problems. This important subject has been presented in a new setting under the caption "Self help is the best help".

It is hoped that this Special Number would help in creating a greater awareness of the problem of environmental sanitation and its legitimate place in the developmental plans of the country.

WAR AGAINST DISEASE

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"A person suffering from chronic dysentery or riddled with worms cannot be expected to do a hard day's work. The economic development of India depends largely on the eradication of water-borne diseases"—Dr J.S. McKenzie Pollock.

ALL of us are engaged in a mighty endeavour—the building up of a Welfare State in which poverty will be a mere memory and all our countrymen will be happy and prosperous.

Happiness and prosperity cannot be attained unless good health is universal. Not all the choicest gifts of the world can bring happiness to a person tormented by disease.

The colossal task of reconstruction of our country requires that everyone should put forth his or her best efforts. This will not be possible unless one is enjoying vigorous health. Illness and mortality are not only painful but are a severe drain on a country's valuable resources. It behoves us, therefore, to give top priority in our plans of reconstruction to the measures necessary for building a healthy and vigorous nation.

It is well-known that nutritious and well-balanced food, proper exercise, rest and recreation are necessary for building strong bodies which can resist disease. Mental equipoise is equally necessary so that these strong bodies may house healthy minds. Personal cleanliness is of prime necessity so as not to fall victims to the multitude of disease-producing agents that are ceaselessly trying to attack us. Above all, cleanliness of our surroundings—environmental sanitation—is very important so that the disease-producing agents do not have a chance to multiply and gather in full strength all around us.

Man is his Own Enemy

Let us recall Pandora of the Greek mythology who let all the pestilences loose on a healthy world by his thoughtless action. This story has a significant inner meaning even today. Any thoughtful person who studies the causation of the common diseases cannot fail to be struck by the fact that most of the communicable diseases to which man falls a victim are really due to the action of the man himself. Thus, a man who pollutes a well causes a large number of people to contract dreadful diseases like cholera, typhoid and dysentery. By easing himself in open fields, man makes it possible for the hookworm to infect himself as well as his neighbours. By failing to keep his surroundings clean and sanitary, he encourages the breeding of flies and mosquitoes which spread disease. Such examples can be easily multiplied. However, the interesting point to note is that almost everyone who thus contributes to general ill-health is not aware of the part he is playing. No one consciously wishes harm to his neighbour. These harmful effects are the results of ignorance and thoughtlessness. It is, therefore, very necessary that everyone is made aware of the way in which diseases are caused and of the way in which man plays an unwitting part in helping the spread of disease. Such knowledge is essential so that each man can take suitable steps to safeguard himself, his children and his neighbours from the ravages of pestilences.

Agents of Disease

The agents of disease are all around us at all times and are constantly engaged in trying to force an entry into our body. Man is at a serious disadvantage in this war against disease because these disease-producing agents can enter the body through several portals. He is at a further disadvantage because the enemy is practically invisible. If he must wage the war against disease in an intelligent manner, he

should first make an attempt to know his enemy. He must learn about its nature, its habits, its method of attack and the best ways of killing it.

Bacterial Agents

Diseases may be caused by malnutrition, by poisonous ingredients, by indulging in excesses and by scores of other causes. In this discussion, we shall confine our attention to the important group of communicable diseases caused by the invasion of harmful germs. A very important group of these are the bacteria which cause the dread diseases like cholera and typhoid. These are very minute organisms visible only under powerful microscopes. They are excreted by man in his stools.

PROTOZOANS

A little higher up in the scale of biological evolution occur the protozoans. Some of these are very dangerous. Dysentery is generally caused by a member of this group—the amoeba.

NEMATODES

Still higher in the scale are the nematodes or worms. Examples of harmful agents in this group are the hookworm, the roundworm, the tapeworm, the guineaworm and the filarial worm.

VIRUSES

During recent times, we are learning more and more about diseases caused by viruses. These are much smaller than even the bacteria and cannot be seen even under the usual microscopes. They are responsible for a number of diseases of which infantile paralysis, smallpox, chickenpox, influenza and epidemic jaundice (infective hepatitis) may be mentioned as examples. Some of these are caused by drinking contaminated water while others are air- or insect-borne.

How the Enemy Attacks

Germs of diseases like the common cold, smallpox, etc., can enter the body through the nasal and oral passages. These germs are released into the atmosphere in the minute droplets of liquid that come out when a person suffering from these diseases sneezes or coughs. Germs of pulmonary tuberculosis are present in large numbers in the sputum of the patients. When such a person conghs or spits in the open, the droplets or sputum releases the germs into the atmosphere.

The eating of contaminated food or the drinking of contaminated water causes dread diseases like cholera, typhoid and dysentery. The germs of these diseases are excreted by man in his stools. (Cholera germs are also present in large quantities in the vomit of a cholera patient). These germs can gain access to our food through lack of personal cleanliness. In places where the people ease themselves in the open, flies can carry the infection from the stools to the food. The stools can get washed down into ponds and streams and thus contaminate the drinking water supply. When wells are not properly constructed, these germs can be carried down into the water by the surface washings or by the water percolating from cess-pools. The contamination of wells is particularly dangerous because it is difficult to detect it. Moreover, such infection can be quite heavy. Since a larger number of people use water from the wells, the number of persons attacked by disease is also large.

Certain disease-producing agents enter the body in the form of eggs or larvae, which are swallowed along with contaminated water or food. Examples of this are roundworm and threadworm. Eggs of these are excreted in human stools and find their way to water sources. Another example is guineaworm infection which is present in some parts of our country. The eggs laid in dirty water by the adult worm hatch out into larvae which get into a small aquatic insect known as *cyclops*. When unfiltered water from such an infected pond is taken, these cyclops get into the stomach and the larvae are released. They grow into adults and work their way to the legs where they cause painful sores. When a person suffering from such sores gets into the ponds, the adult worm in his body gets a chance to lay eggs in the water.

Infection through Insects

As we have seen, insects such as flies may spread diseases by transporting the germs from filth to our food.

In the case of diseases like malaria or filaria, the disease-producing agents are actually injected into our body by the bite of the mosquito. Recent work

has shown that mosquitoes and other insects can also cause a number of virus infections.

Infection Through Unbroken Skin

Hookworm is an example of infection occurring through the unbroken skin. Eggs of hookworm are excreted in human stools. In areas where people ease themselves in the fields, the eggs hatch out and the larvae get widespread in the soil. Persons who walk barefoot in such areas get infected by these larvae which can penetrate into the skin of the feet.

Remedial Measures

It may be asked why all people should not be inoculated against diseases so that we can escape the consequences even if infection takes place. Such a remedy is not possible for the following reasons :

(*i*) Immunity by preventive inoculation is not possible in all diseases.

(*ii*) Even in the diseases where immunity is conferred, such immunity lasts only for limited periods of time. Hence, such inoculations are useful only when repeated periodically.

(*iii*) Even if it is possible to immunize ourselves effectively, it will not be practicable to get *all* the people inoculated.

Our main line of attack has, therefore, to be in the direction of protecting ourselves against infection. This is done by observing rules of personal and environmental hygiene which help us to avoid getting infected and by improving environmental sanitation so that the germs cannot thrive and multiply.

Cycle of Transmission

From the brief discussions on the modes of transmission of the several diseases, one would have noticed the existence of a cycle in which man plays an essential part. For example, in the case of malaria and filaria the cycle is as follows :

Man—Mosquito—Man

Our general strategy, therefore, is to break the cycle as effectively as possible. Thus, in the case of malaria, we wage a war on the carrier mosquito in all its stages. By taking care not to allow stagnant pools of water near houses, we reduce the breeding of mosquitoes as far as possible. Where breeding is taking place, we kill the larvae by application of oil. We also wage a war on the adult mosquitoes by spraying D.D.T. in our houses and elsewhere. By promoting the habit of sleeping under mosquito nets, we break another link in the cycle by not allowing the mosquito to bite us. Treatment of the patient helps further because every cured person contributes in reducing the chances of infecting the mosquito.

The diseases in which the infection occurs through the contamination of food and water by stools deserve a closer study for several reasons. They form the large majority of communicable diseases and include such fatal diseases as cholera and typhoid. When such diseases break out, there are severe epidemics involving large numbers of people. The cycle in this case is as follows :

Man—Stools—Food or Water—Man

Our attack can be at several links in the cycle. By developing proper habits, every man can safeguard himself from infection. Thus; personal cleanliness enables him to prevent the carrying of infection from his own stools to his mouth. By developing the habit of not eating exposed foods, he can safeguard himself against fly-borne infections. Side by side, we may wage a war against the housefly. The habit of easing oneself in the fields leaves the stools exposed so that infection can be transmitted by the flies. It also causes the spread of diseases like hookworm. Hence, people should learn to use properly constructed latrines.

Cumulative Benefits

A point worthy of note in this approach against disease is that the total beneficial results are much greater than the direct results. Every reduction in the incidence of disease results in one person less in the group which excretes the harmful germs. Each unhealthy person has a potential for infecting a large number of healthy persons and so the "self-generating" nature, so to say, of the beneficial process is obvious.

There is also another incidental advantage. By controlling water-borne diseases, we increase the resistance of the people so that even other diseases fail to get a foothold. Thus, there is a general decrease in the incidence of all diseases.

Fly-borne *vs* Water-borne Infections

Infections caused by flies are generally of sporadic nature whereas the infection caused by drinking water is explosive in character and involves a very large number of people. Hence, this aspect deserves a closer study. We should take effective steps to dispose of the stools promptly and effectively. We should take all possible precautions in the construction of wells so that they are not contaminated. We should also take steps to effectively treat a contaminated water supply so that the harmful germs are destroyed and the water rendered fit for drinking. It is clear, therefore, that in our fight against disease, the twin aspects of effective methods of disposal of wastes and the provision of safe water supply should receive special emphasis.

Wells

In the case of wells, our endeavour should be to take all possible precautions to prevent the contamination of the water by surface seepage which carry objectionable material. Care has to be taken both in the location and construction of the well. Well-drained platforms should be provided all around the well so that the dirty water does not get into the well. Since contamination can occur through the open top and also through the use of dirty ropes and bucket it is necessary to cover it and provide a pump. When men get into a well for construction or repairs the water necessarily gets contaminated. Hence, every well should be disinfected after construction and every time repairs are carried out.

In the case of surface supplies, it is difficult to exclude pollution. As a matter of prudence, it is desirable to look upon every surface source as contaminated and to install effective treatment processes to render the water safe and wholseome. The minimum treatment necessary is regular and systematic chlorination to kill the germs. Where treatment facilities do not exist, the water should be boiled before use.

The mere provision of a treatment plant for water is not adequate. Competent personnel who have a proper appreciation of the health hazards and are trained in operational techniques should be employed to be in charge of the treatment processes. These personnel should take care not only to see that the water is effectively purified but that it is supplied to the consumer without undergoing pollution on the route.

Safeguarding Quality of Raw Water

Several people, including administrators, often ask why we should bother about the quality of our raw water sources when we haveins talled treatment plants. Such a view is fallacious. In a country like ours, water from rivers is often used without any treatment. Even in places where treatment facilities are provided, it is desirable to avoid indiscriminate pollution of rivers. It must be remembered that the agency in charge of the treatment process is, after all, human and, hence, not infallible. New diseases are coming up and our usual treatment processes may not always be effective against the consequences of heavy pollution.

Now that India is going through a rapid industrial revolution, the danger of pollution by industrial wastes is an added problem to which attention has to be bestowed. Such pollution is not only heavy but introduces new and complicated chemicals about whose affects on health we have not adequate knowledge. Apart from the health hazards, heavy pollution converts the pleasant groups into stinking gutters devoid of fish life and makes the water unfit even for bathing or recreational purposes.

Role of Public Health Laboratories

It is thus seen that the provision of safe drinking water and the effective disposal of human wastes, constitutes the major programme in our war against disease. This war has to be fought on many fronts and requires the aid of scientists trained in several disciplines—engineers, doctors, chemists, biologists, bacteriologists, entomologists, epidemiologists and educators. The control of river pollution requires the testing of samples of wastes and of river waters. Constant testing is necessary to ensure that the water as supplied is *always* safe and wholesome. Studies are necessary on newer diseases so that effective measures can be taken to control their spread. For all these purposes, our country should have a large number of public health laboratories, forging new weapons, devising new strategies, and verifying the effectiveness of the measures adopted.

For winning the war, we need public cooperation

DEVELOPMENT OF WATER SUPPLY

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THE primary source of all water supplies is rainfall. The rain, as it falls, gathers some dust and gases from the atmosphere and after reaching the earth's surface, some of it sinks into the ground, some evaporates and some runs off on the surface. The water that runs on the surface makes its appearance in streams while of the water that enters the ground, some is absorbed by vegetation, some is held by the soil and the balance percolates downward until it reaches the impervious stratum. The water that has thus accumulated above the light stratum forms the ground water or the sub-surface water. Thus any water supply has to be developed from one of the three broad categories of sources, *viz.*, (*i*) direct from rain, (*ii*) from surface streams, ponds and lakes and (*iii*) sub-surface sources.

Water Supply for the Villages

The question of providing safe water to our villages with a population of 359 million out of the countries 436 million has been engaging the attention of our governments. Large number of works have been taken up under the successive Five Year Plans to provide drinking water supplies to our villages. The work has been in the form of developing new sources of water supply and also renovating old ones.

Basic Requirements

Any water supply, either to an individual or for a community, should be safe, potable and adequate. The subsoil water, when utilised as a source, has the advantage of being free from many impurities by virtue of the filtration it undergoes while percolating through the soil.

Spring as a Source

The subsoil water, sometimes under favourable geological conditions, makes its appearance on the surface in the form of springs. These springs generally occur on slopes and more commonly in hilly areas and form a very good source for villages and towns nearly depending on the quantity they can yield all through the year. The springs should be protected from all contamination though surface washings by constructing catch drains and leading the surface flows away from the spring. The spring water can be collected in a small cistern from where a pipe can convey the supply to the house or the central distribution reservoir or street taps in the village. The supply can be completely made safe by covering the cistern to prevent any access to birds, animals and dirt and arranging for chlorinating the supply with a clear solution of bleaching powder continuously dropped into the tank by a simple chlorinator.

Dug Wells

When natural springs are not available, the shallow dug well is the most practical source of supply, but it requires far more attention and improvements as regards convenience and sanitation than it has generally received.

The location of the well should be such that the chances of pollution of the water in the well, is eliminated. There should be no bore-hole latrine or soakage pit and the like anywhere within a radius of 8 metres (30 ft) from the well. This distance again depends on the porosity of the soil, level of ground water, its slope and direction of flow from the well and it will have to be considerably increased so that there is sufficient filtering action to arrest all the pathogenic germs from entering the well.

In order to prevent any direct pollution of the water in the well, it should have a good steining or side wall and should be provided with a platform and drain to collect and carry the spill water sufficiently away from the well. The use of ropes and buckets is likely to contaminate the well. The best method

is to cover the well and use a pump to draw water. Hand pumps are not very expensive but require manual operation and simple maintenance in replacing broken screw or a handle or a worn-out leather washer. A more convenient arrangement, if there is sufficient money, is to install a power driven pump-set and pump the water into a tank for distribution.

The small community well can be located with advantage in the bed of a tank or a river in order to draw water of good quality in good quantity. The supply can be pumped to a central place in the village for further distribution through a tank or stand-posts.

Driven Wells

Yet another way of developing a shallow sub-surface source for rural areas is by means of driven wells fitted with hand pumps. This method is specially suited for alluvial soils where it is possible to drive down a perforated pipe covered with wire mesh, called a filter point, and then pump out a supply. A platform and a lead-off drain will make the well complete and good enough for a small community.

Stepped Well—Its Drawbacks

It had been the practice in certain parts of this country to construct stepped wells where the user has to walk down the steps to collect water. Though the steps have provided an easy method of drawing a supply, the same has been proved to be the cause for a great public health problem. The wells have played an important role in the transmission of the guineaworm. The first remedial measure to be undertaken in this case is only to cut down any human access to the water by closing the steps. The further improvements to be carried out are to cover the well and provide a pump to draw the supply.

Renovation of Old Wells

The renovation of old wells has also been engaging the attention of the agencies providing rural water supplies. Apart from deepening the wells and cleaning them up to increase the yield steps should be simultaneously taken to prevent pollution. The well should be provided with a good steining, a cover, platform and spill water drain and a pump. Any bore-hole latrine or soakage pit and the like within a radius of 50 ft should be avoided. Education of the people in the use of hand pumps and their proper maintenance should also go side by side with the provision of protected water supply to rural areas.

Water Supply to Groups of Villages

There are conditions which do not allow the development of an adequate, potable and safe water supply from local wells for individual villages. Under such circumstances, it may be necessary to go in for a distant source. In order to reduce the financial burden on the villages, it may be possible to group neighbouring villages and supply them all from a common source, but this may need careful planning, investigation and design by qualified public health engineers.

Urban Water Supply

The provision of a water supply to urban areas is different from that for rural areas in certain ways. Firstly, the *per capita* consumption of water is higher than in rural areas. While a supply of five to ten gallons *per capita* per day may be sufficient to meet the requirements of a rural community, a supply of 15 to 25 gallons may be necessary for mid-sized towns and a supply of over 25 gallons will be necessary for a large-sized town with its underground sewerage system and demands for industries, etc. The actual *per capita* supply provided should bear a relation to the actual needs and the financial capacity of the community that is to own the system. It will be unrealistic to plan a supply of say 40 gallons *per capita* per day for a village or a five gallons *per capita* per day supply for a city.

The Tube Well

For mid-sized towns, where geological conditions are favourable, deep tube wells can be developed as an economical, safe and reliable source of water supply. These tube wells range from 70 feet to several hundreds of feet in depth and $1\frac{1}{2}''$ to 18″ diameter. The number of tube wells to be put down will depend on the yield of the well and the quantity of water to be supplied to the community.

Tube wells have been quite successful in river basins but at times the water drawn from great depths contain dissolved gases, salts and iron. The simple way to remove the gases is to aerate the supply in a fountain or a cascade or a special aerator designed for the purpose. The dissolved forms of iron also get oxidised during aeration and converted to settlable forms. The water can then be settled in tanks and then supplied. Sometimes, certain chemicals like lime are added to accelerate the removal of

iron. The calcium and magnesium salts that get dissolved in the subsoil water during its passage through ground, contribute towards the hardness of the supply. The water has to be softened if the hardness exceeds the permissible limit. One of the methods to soften the water is to treat it with lime and soda which precipitate the dissolved calcium and magnesium salts. The water is then settled, filtered and supplied. Another method of softening is to bring the water in contact with certain artificial resins known as ion exchangers. The ion exchangers have to be regenerated from time to time by a solution of brine.

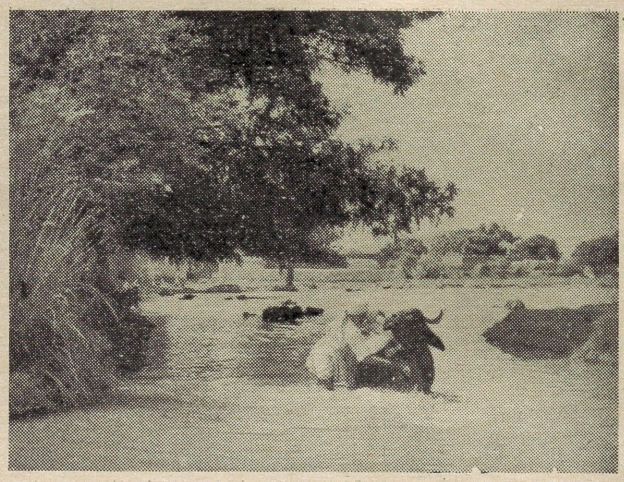
The Infilteration Gallery

There are quite a number of rivers which are dry for a good portion of the year but they carry appreciable quantities of subsoil water within their beds. Under such situations, the infilteration galleries come in very handy to develop a water supply. These infilteration galleries can be considered as long horizontal wells. They are generally formed by digging up a deep trench sufficiently below the lowest subsoil water level and laying an open jointed pipeline enclosed by clean graded metal gravel and coarse sand. The trench is finally closed with cleaned excavated sand. The water enters through the graded material and collects through the gallery pipe in an end well from where it is pumped out for supply. These deep trench-like filter galleries are used where the river is subject to uncontrolled flows; but where the flow is strictly regulated, a much wider and shallower basin, known as a "filter basin" is employed. Here the controlled surface flow itself infilters through the bed of graded material and enters a system of collection pipes and the end well for being pumped out finally for supply.

Surface Sources

Supplies drawn from surface sources, namely streams and tanks, as already mentioned, are not always free from pollution. Where special sanitary precautions have been taken, the water drawn from impounding reservoirs with protected catchments may be bacteriologically safe but even then disinfection has to be done to make doubly sure that the supply is safe.

The water drawn from surface sources, when found contaminated, has to be filtered. When the water is found turbid with plenty of inorganic matter,



Pollution of water

it is first allowed to settle in a settling tank or a sedimentation basin for a sufficient time to remove the bulk of the settleable matter. The water is then given the required treatment to make it fit for human consumption.

It is not always possible to settle all the solid matter in a sedimentation basin. This is specially so when the solids are present in a colloidal form. In such cases, the water has to be specially conditioned before it can be filtered and supplied. The water is treated with a dose of alum or ferric chloride which forms a floc that attracts all the colloidal particles and settles down, giving a fairly clear water ready to be filtered. In order to carry out this pre-conditioning effectively and economically, laboratory tests have to be conducted regularly and the performance of the units watched carefully.

Slow Sand Filter

The oldest and the simplest form of filter is the slow sand filter. This is simple to operate but occupies a large area. The standard rate of filteration is only 50 gallons per sq. ft. per day. The filter consists essentially of an under-drainage system on top of which graded layers of stone and gravel are arranged to form the foundation for a 30″-36″ thick layer of granular sand. Waters of very low turbidity alone can be treated in these slow sand filters. As the water passes through the sand, a slimy layer is formed on the surface of the filter. This layer arrests the bacteria in the water and the clear water is drawn out of the filter through the under-drain systems.

Rapid Sand Filter

The rapid sand filter, unlike the slow sand filter, can filter at a very high rate of 100-125 gals. per sq. ft. per hour which is about 50 times as fast as the slow sand filter; but the water requires careful pre-conditioning with a suitable coagulant. The rapid sand filter requires very careful operation and frequent washing. Its run or interval between two successive washings is very short compared to the slow sand filter; but the washing of a rapid sand filter is done hydraulically and completed in a matter of few minutes. The time for washing any filter is determined by the loss of hydraulic head for the water to pass through the filter. It may vary between 1-3 days for a rapid sand filter and four to six weeks for a slow sand filter. The washing of a slow sand filter is done manually.

A close watch with the help of laboratory tests is required for the proper operation of a rapid sand filter and in view of the special pre-conditioning of the water, the rapid sand filter can handle water of very high turbidities; on the other hand, the operation of the slow sand filter is much simpler.

Pressure Filter

There are a few other types of filters which are used under special circumstances. Of these, the pressure filter is one. This comprises a closed steel cylinder containing the filter media and the under-drainage system. Water is forced through the filter under pressure. As it enters the cylinder, it picks up a small quantity of coagulant. The action is the same as in the rapid sand filter. This filter can deal with waters of low turbidity and are preferred for temporary installations in view of their portability and savings in elaborate civil structures.

Disinfection

All public water supplies must be disinfected before delivery to the consumer, whether the supply has been filtered or not. This is to ensure that all the disease-producing bacteria have been killed.

Chlorination is the most common and convenient method of disinfecting public water supplies. Chlorine is applied to the supply either in the form of a solution of bleaching powder (for small supplies) or as liquid chlorine (for larger supplies). An adequate period of contact (minimum half an hour) should be allowed to enable the chlorine to exercise its action.

While chlorination affords satisfactory protection against the more common bacterial agents of diseases at normal doses, it is not very effective against certain microscopic organisms such as the cysts of *E. Hystolytica* which are responsible for dysentery. For these and other reasons, disinfection cannot be a substitute for filteration.

Distribution

The method of distributing the supply to the consumer is also a specialised job when a large population has to be served with adequate quantity of safe water. In a small village, the villager generally has the time and personnel to fetch water from the common well or tap or the distribution reservoir. In bigger towns, the supply has to be delivered at the door steps.

The demand of water by the community also varies from hour to hour and season to season. The demand is generally on the increase from year to year as the town grows and its population increases. The distribution system has to be designed taking into account all these factors. A service reservoir or a balancing tank is generally installed to store up water during lean hours of supply and meet the increasing demand when the occasion needs extra flow in pipes. The system is designed not only to meet the variations in demand but also to ensure a minimum terminal pressure at the ends of the system.

Fairs and festivals are quite frequent in India. During these, large number of people from different parts of the country congregate for a short time and hence the arrangements of water supply to such fairs and festivals have to be planned carefully so that these gatherings do not serve as focal points for the spread of water-borne diseases. It is necessary that these places should be provided with protected (piped) water supplies but until then, as temporary measure, lorries fitted with pumps, filters and disinfection equipment should be maintained or temporary storage tanks and public stand-posts should be put up.

Water Supply from Sea Water

The question of developing a public water supply for drinking purposes from sea-water has also been

(Continued on page 214)

REFUSE AND EXCRETA DISPOSAL IN RURAL AREAS

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THE health of the rural people in India is very important for the progress of the country since more than 80 per cent of the population live in villages. Considering that enteric and intestinal parasite diseases as well as filth-borne diseases constitute a great health problem, proper water supply and sanitation facilities are needed to prevent the spread of infection by cutting out the transmission of these diseases contacted through water supply, by insect and animal vectors and by contact with polluted soil.

Rural waste includes garbage, ashes, street sweepings, rubbish, animal droppings, wasted animal fodder, dead animals, etc. The liquid waste from houses and the vicinity forms sullage. From the health point of view, the sanitary disposal of human excreta, rural sullage and other refuse is essential.

Sanitary Disposal

The present practice of disposal of these materials is not very satisfactory. Refuse is dumped indiscriminately into any pit or on any vacant plot available nearby. The villager thinks that as soon as the refuse is removed from his land it is disposed of. Occasionally, however, he reserves a portion of his plot for dumping the refuse. Dead animals are thrown on the common ground adjoining the village. The sullage takes its own course through the streets or lanes to the lowest depression in the village or just outside it. Animal droppings are dumped in some convenient places throughout the village and the vicinity, thus forming a good breeding ground for flies. Faecal matter is deposited indiscriminately all over the village. The fringe of the village and the approach roads are the main venue for the disposal of human excreta. The villager dares more for his personal cleanliness and the cleanliness of his house than he does for the great health hazard the insanitary disposal of the village waste can cause him.

Excreta Disposal

Sanitary disposal of human excreta is a very important part of environmental sanitation. Unhygienic disposal of nightsoil leads to a contamination of the source of water supply thereby causing intestinal diseases such as cholera, typhoid fevers, diarrhoea, dysentery, etc. It also affords opportunities for flies, rodents, birds, animals and other vermins to have access to human excreta. They spread intestinal and filth-borne diseases. Pollution of the soil with human faeces will also lead to hookworm and other worm diseases.

The ideal method of controlling access of insects, birds and animal vectors to human excreta is the water carriage system of sewage. This, however, needs treatment and disposal in such a way that it does not pollute any water course used as source of drinking water. Every effort should, therefore, be made to install water carriage system wherever running water is available in the house. It is not possible to provide such facilities in many villages. In all probability, human excreta will be disposed of without water carriage system in most of the villages, small towns and other suburban areas for many years to come.

When water supply is not installed, non-water carriage system of excreta disposal is adopted. If the excreta is kept rather dry by the exclusion of ground or surface water or house sullage, production of odorous gases is slow. Anaerobic bacteria split the organic material into instable substances. Finally, a reduced quantity of humus like material with musty

odour is left out, which can be disposed of conveniently. If, on the other hand, the excreta is kept wet with sufficient water, septic action sets in. The stabilization process in this case is quicker.

Service Latrines

In most of the villages, no special method is adopted for excreta disposal. In certain villages, and in most of the towns, the pail or pot type latrines are still in use. Watertight cans or glazed stoneware pots are placed under the seats so as to collect the faeces and urine in them. Usually, the back of the latrine is towards the service lane. A hinged door is so placed that the scavenger can remove the pail without entering the privy. Scavenging is done everyday. The contents of the pail is removed and the pail is washed and replaced. Nightsoil is carried in a truck to a place away from the village and buried in trenches which are covered with a minimum of 12 inches of earth. The nightsoil is digested in three to six months by which time it is reduced to stable material, which may be used as fertilizer.

In actual practice, the pail privy cannot be operated and maintained in a hygienic manner. It attracts flies enormously not only at the latrine site but all along the route by which the nightsoil is conveyed and at the disposal ground as well. This system requires considerable handling of nightsoil by human beings. The pails are often too small and are not emptied regularly. Also, they are not usually cleaned well. The liquid excreta and the urine are rarely collected and run into the surrounding area or into the sullage drain and stagnate. The hazards of soil pollution and of surface and ground water pollution is ever present. The nuisance of odour and unsightly conditions are a regular feature in this type of latrine. Even though the initial cost is not very high, the operation and maintenance cost makes it one of the most expensive types of latrines. It is difficult to recruit and maintain an army of labourers for the cleaning of such latrines, removal of nightsoil and its final disposal. It is just inhuman to maintain a class of people for this demeaning service.

The construction of an ideal latrine should, therefore, be such as requires no service and the human excreta should be disposed of at the site of the latrine in an hygienic manner. Bore-hole latrine, pit privy, waterseal pit latrine, septic toilet and the septic tank

A Sanitary Latrine

latrine as well as stabilization pond are suitable to the villages. They require no scavenger service and are reasonably clean and safe.

Pit Latrine

The pit privy is quite cheap to construct and easy to maintain. It does not require a technical person in its erection or operation. Within reasonable limits it satisfies the requirement of a sanitary latrine for the individual rural home. It consists of a pit in the ground with a squatting plate fixed on top of it. A super structure to afford privacy and shelter is built around it. The functions of the pit are, (*i*) to isolate and store the nightsoil so that the disease-producing bacteria will not be transmitted; (*ii*) to store the human excreta so that it may be digested and can be disposed of easily and, safely, and

(*iii*) to remove the nuisance of odour and unsightly appearance.

The pit is round or square in shape with a diameter or a side of 2′6″ to 3′6″ with a depth of 6′ to 12′. A pit with a volume of about 50 cubic feet is sufficient for an average family to serve for a few years. The pit may preferably be lined for the first three feet depth to avoid caving in of the sides. This is necessary in fine alluvial or sandy soils. Bricks, stones, concrete or laterite blocks, bamboo and wood may be used as the lining material. The bottom of the pit should not penetrate the ground water level. The squatting slab is of cement concrete with a small round hole through which the nightsoil passes into the pit. The superstructure may be of any design or material which will fit the dimension of the slab. It should be of sufficient height with necessary ventilation and lighting and should be kept in good repair and clean state.

The pit latrine may be located a little away from the house. But the safe distance of it from a well depends upon many factors such as the level of the water table, its slope and the direction of flow of the underground water and the porosity of the soil. Ordinarily, a minimum distance of 30 feet is considered sufficient. The pit and the floor should be well protected from surface run off. When the pit is nearly full, it should be filled with earth and abandoned and a new one used. When the second one is filled, the first one can be cleaned and re-used.

Bore-hole Latrine

The bore-hole latrine is a variation of the pit privy. It comprises of a small round deep hole bored into the ground with an earth augur, instead of the pit in the case of a pit privy. The bore is 16″ to 18″ in diameter and 15′ to 20′ deep. Two distinct types of bore-hole latrines are in use—the wet and dry types. The dry type functions as the pit latrine whereas the wet latrine functions as the septic tank aiding the digestion of the solids quicker, thereby prolonging the life of the latrine. But this type is dangerous in the transmission of pollution compared to the dry type. When the underground water table is high and a dry bore-hole latrine is to be constructed the bore-hole is likely to get filled up too soon. In such cases it is better to have the mound latrine. In this case, a cement concrete pipe, a brick shaft or an empty barrel is built over the shallow bore-hole to a height of about three feet. The squatting slab is placed on top of the shaft and superstructure built around it.

Water-Seal Latrine

The water-seal latrine is an improvement on the pit privy and the bore-hole latrine. The squatting plate has a specially made bowl which contains a water-seal whose depth is 0.5″ to 1.5″ and prevents odour from escaping from the pit. Flies cannot gain access to the contents of the pit. In this type of latrine, the slab may be installed directly over or near the pit, bore-hole or septic tank. The usual quantity of water required for ablution is sufficient to flush the contents into the pit. When the squatting plate is fixed directly over the pit, cleaning of the pit is difficult. When superstructure is of a permanent nature, the water-seal latrine can be located separately and behind the squatting plate and it may be connected to the pit by a lead off pipe. (For complete details of construction and method of operation of the water-seal latrine refer *Rural Latrine Programme*, published by the Directorate-General of Health Services)

Septic Latrine

The septic toilet is a tank usually constructed of brick or concrete and filled with water. The squatting plate is fixed on the top of the tank. The tank should necessarily be watertight. The nightsoil and urine fall into the water and are liquified. The sediment settles down where it is retained for a sufficiently long period for all organic matter to undergo anerobic decomposition. A small quantity of water is added everyday for the efficient functioning of the septic toilet. The digested sludge which will be considerably reduced in volume will have to be removed when its accumulation is about 40-50 per cent of the capacity of the tank. A manhole is provided to withdraw the sludge whenever required.

The tank is usually square or reactangular in shape. The size of the tank varies with the number of users and the interval of removal of the digested sludge. A tank of 30 cubic feet capacity is sufficient for an ordinary family with a cleaning interval of five to six years.

The effluent which is more or less equal to the volume of the water poured in is septic in character and loaded with faecal matter in the process of decomposition. It may also carry disease-producing bacteria. This liquid, even though small in quantity, should not be allowed to run into open ditches. This may be disposed of by seepage pits.

With the implementation of the National Water Supply and Sanitation programme the villagers are getting protected water supply right at their doorsteps at the street taps. Well-to-do villagers and institutions in the rural parts are clamouring to have running water in their buildings. They like to install water carriage systems of disposal of human excreta and other liquid waste from the houses. But the problem of disposal of the huge quantity of liquid waste thus created in the rural areas is a serious problem. In addition, where there is no public sewer system this involves the installation of a private sewarage and sewage disposal system which often proves to be a costly proposition. Construction of cesspools, septic tanks, etc., by local workmen who know very little of these sanitary constructions and improper maintenance of the installations will lead to serious problems in the rural areas. This is because in these areas ground water is often the source of drinking water supply.

Cesspool

A leaching cesspool is a well latrine or a covered pit constructed in porous soil into which raw sewage is led. The sides are lined with open brick or stone masonry. The liquid portion of the raw and digested sewage seeps off into the porous soil. An outlet tee (T-shaped pipe) and an overflow should be provided to let out the effluent in case the pores are choked up or the pool is filled up with the sediment. Cesspools are occasionally used for receiving the effluent from aqua privies, other cesspools and septic tanks as well as bathroom and kitchen wastes. Then it is called a seepage pit. The cesspool or seepage pit has the disadvantage of being a potential danger of polluting the underground water. They should, therefore, be carefully located in such a way that they do not contaminate drinking water supplies. They may be convenient for isolated homes but their use is not generally recommended.

Septic Tank

The septic tank is a covered one in which the sewage led from the houses stays for a period during which heavier solid particles settle to the bottom. These solids are decomposed by the anaerobic bacteria while the solids in solutions and colloidal form are conveyed in the effluent for disposal. It is usually constructed of brick or concrete. The inside of the brick tanks are made watertight by plastering it with cement mortar. The capacity of the tank should be sufficient to hold the average daily sewage flow with room for a sludge storage for a period of two to three years. Many designs of septic tanks are in use. However, a minimum capacity of 64 cubic feet is necessary for a single-chambered septic tank for satisfactory operation. For larger multi-chambered tanks, a capacity even as low as eight hours' detention has been adopted.

There is an erroneous belief that the sewage in passing through the septic tank has been treated completely. This is not at all the case. The heavier particles settle down but the effluent contains a portion of the putrescible organic matter in suspension and solution and pathogenic bacteria. It should, therefore, not be allowed to run in open ditches or disposed of over land for irrigation or into fish ponds. Further treatment is necessary to oxidise the remaining organic matter. Depending on the various factors connected with it, the effluent may be disposed of by one of the following methods, *viz.*, dilution, seepage pits, sub-surface irrigation, filter trenches, sand filters, trickling filters, etc.

Disposal of Septic Tank Effluent

Earlier, a seepage pit has been described. In sub-surface irrigation, the effluent from a septic tank is dispersed into the top layers of the soil. The bacteria present there reduce the sewage into a stable material. Plain and drain tiles of four-inch diameter and one or two feet long are laid with open joints with a gap of say $\frac{1}{4}''$. The sewage which passes through the pipe runs out through the gaps. The pipe is laid in trenches and surrounded at the bottom, sides as well as for a small height at the top with gravel. Sand filter trenches, sand filters or open sand filters may also be used provided sufficient attention can be paid to the installation and its operation.

Trickling Filters

Trickling filters are used to treat the sewage after it has been settled in the settling tanks. They are

also used for treating the septic tank effluent where sufficient technical service is available. The effluent is made to trickle down intermittantly through a bed of broken stones. It is oxidised by the bacteria and other organisms living in the coating of the stones and thus reduced to stable material. The effluent from the trickling filter may contain considerable quantity of suspended matter which may have to be removed by sedimentation. The sewage is applied by means of sprays located at the surface of the bed or by means of pipe arms which are turned by the sewage as it spreads itself on the bed. The bed is made of crushed stone or gravel 1½" to 3" in size and to a depth of about five feet. The sewage is collected in the under drains in the bottom of the bed.

Stabilization or Oxidatian Pond Method

A very economical and effective way of treating the sewage is gaining ground. This is the stabilization or oxidation pond method, and it is very suitable for the villages as it requires not much technical supervision once it is carefully designed and properly installed. It costs much less than the conventional sewage treatment units. A stabilization pond is an earthen structure of regular shape, length, breadth and uniform thickness constructed and maintained as a device to treat sewage. It may contain one or more units. Stabilization is accomplished by the self-purifying process. Sedimentation of the sewage occurs in the pond and decomposition takes place. This process releases organic nutrients which diffuse throughout the liquid and are utilised by the algae. The oxygen produced by the algae by photo synthesis is utilised by the bacteria present in the colloidal as well as in the settled sewage. The conditions for the effective working of the algae, bacteria, etc., should be controlled so that the pond may function efficiently.

The design of the pond depends upon many factors such as strength, type and volume of sewage; loading per unit of surface area; temperature of the atmosphere and availability of sunlight.

Since there will be slight odour the stabilization pond may be located at not less than 500 feet from houses. In a pond properly constructed and maintained, weed, insect-breeding and other problems will not be serious. When the ponds are constructed in porous soil, the bottom and the sides should be sealed as otherwise the pond will be dried up making the sewage septic.

Disposal of Refuse

So much for exereta disposal. The sanitary disposal of refuse is also of importance. Brief suggestions for refuse disposal are given below. Trash, such as broken walls, broken utensils, implement, etc., should be dumped in the low-lying areas of the villages in layers so that the depression can be filled up slowly and uniformly. Leaves, straw, wasted animal fodder, garbage, and other refuse may be mixed with animal droppings and composted scientifically as fertilisers. But the mixture be dumped in a controlled depth and width and covered with straw, leaves and a layer of earth. This will prevent the composting pit from being a breeding ground for flies. The practice of mixing nightsoil with garbage and animal droppings prevalent in certain areas should not be allowed to continue as this will create problems for their sanitary disposal.

Use of a metal container with lid for throwing garbage and refuse is a good practice. These containers can be emptied everyday. The practice of throwing dead animals just on the outskirts of the village to rot and be eaten by birds and animals is dangerous. Carcasses of animals should be buried in such a place that the underground or surface water will not be contaminated by them.

Disposal of Sullage

Another important sanitary measure needing mention is disposal of sullage. Pucca drains must be constructed to lead the house sullage, the spilt water from wells and from street stand posts away to soakage pits or to private gardens. The darins should not be used to throw in the refuse and street sweepings nor should they be used as the place to ease or urinate, not even by children.

Sanitary disposal of human excreta and refuse in the rural areas is a community venture needing participation of the individual villager. The village panchayats and other public bodies should undertake the responsibility so that suitable methods may be adopted for proper planning, construction, management and supervision of the individual sewage and refuse disposal systems. Individual families can also install satisfactory waste disposal system, provided necessary assistance, both financial and technical, is made available to them.

PROBLEMS OF URBAN SANITATION

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INDIA has been essentially a country with emphasis on its villages. The average Indian villager is endowed with a native shrewdness and a sense of personal cleanliness. Village planning, village life and village administration as he knows it, does not accentuate problems of insanitation to any degree such as to endanger the public health of the village community. But with the shifting of the emphasis gradually from the village to the urban areas and the gradual urbanisation brought about by the industrial development of the country, the villager finds himself transplanted into the urban townships where insanitation is a growing problem, for the solution of which he lacks the means and the resources. The Government has transferred all responsibility for public health to the State Governments who, in their turn, have transferred it on to the weak shoulders of the local bodies with their slender financial resources. The result is that while urban areas are attracting more and more villagers into their orbit, the urban local bodies have become less and less competent to deal with the health problems of the community entrusted to their charge. Environmental sanitation has been relegated to the background in the consideration of their civic problems by local bodies, if only for the reason that the provision of water supply and sewerage amenities are far beyond their limited resources. The curative aspects of public health, *i.e.*, medical, are pursued as the only means of combating the ill-effects of insanitation.

Environmental Sanitation

The development of public health engineering with a view to embrace the field of environmental hygiene is of recent origin. It gained importance with the shifting of the emphasis from the curative to the preventive aspects of public health. This again is a result of the growing industrialisation and urbanisation in the more advanced countries in the West which pin-pointed problems relating to environmental hygiene as demanding immediate attention for the healthy living of the community. Public health engineering, accordingly, has come to be realised as a specialised subject including in its purview all activities bearing on the environments of the people. This concept is slow to establish itself in the underdeveloped countries. Our local bodies, therefore, have neither the wherewithal nor the professional advice necessary to grapple with the problems caused by insanitation.

There has been a rapid increase in the size of the urban population all over the country since Independence. The provision of basic essential amenities like water supply and collection and disposal of human wastes has not been kept up to a corresponding level. In fact, these amenities are now lagging far behind and environmental sanitation as a problem is growing in magnitude and intensity all over the urban areas. The stage has been reached when the problem has to be solved effectively, systematically and quickly.

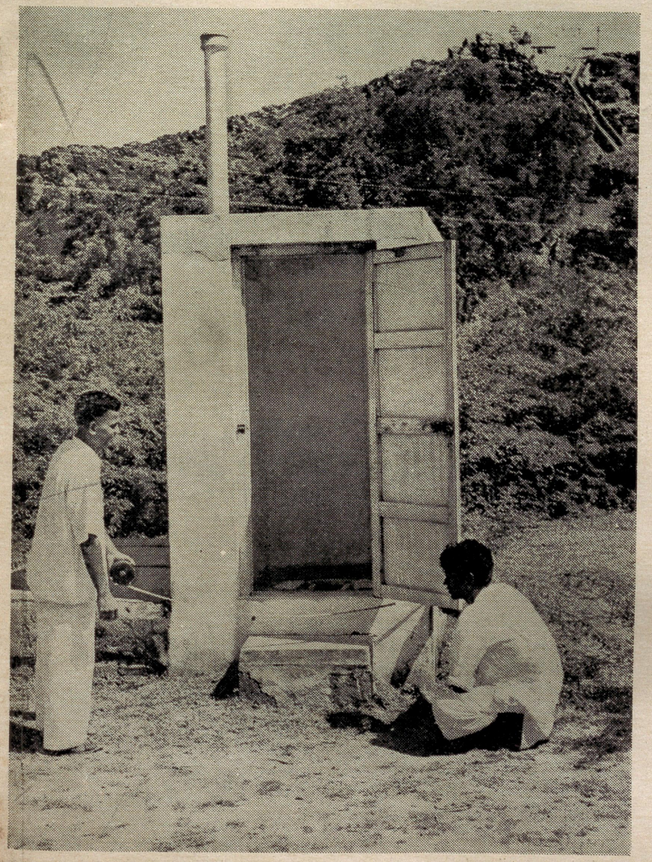
Rural Sanitation

In the rural areas, the solution to the problem can perhaps, be localised. Individual house water closets in rural areas, with disposal of the liquid wastes by sub-surface dispersion could alike supplant the alternatives of a sewerage system and a sewage disposal necessary in an urban area. By localising the sanitary measures within the four corners of each village house, environmental sanitation of the village area, as such, will be less of a problem. Any local crowded area within the village which does not lend itself to such individual treatment of the problem can be dealt with by the provision of a sewer system and disposal arrangement for that particular locality at a far cheeper cost than would otherwise be the case. In this way, the installation and maintenance of simple but effective measures to ensure environmental sanitation in the rural areas can be

CLEANLINESS—A WAY OF LIFE

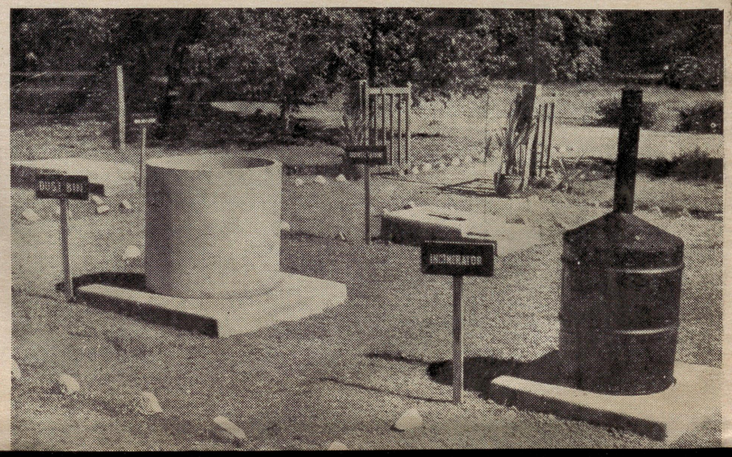
Sweeping the dust and litter away

Proper drainage in rural lanes



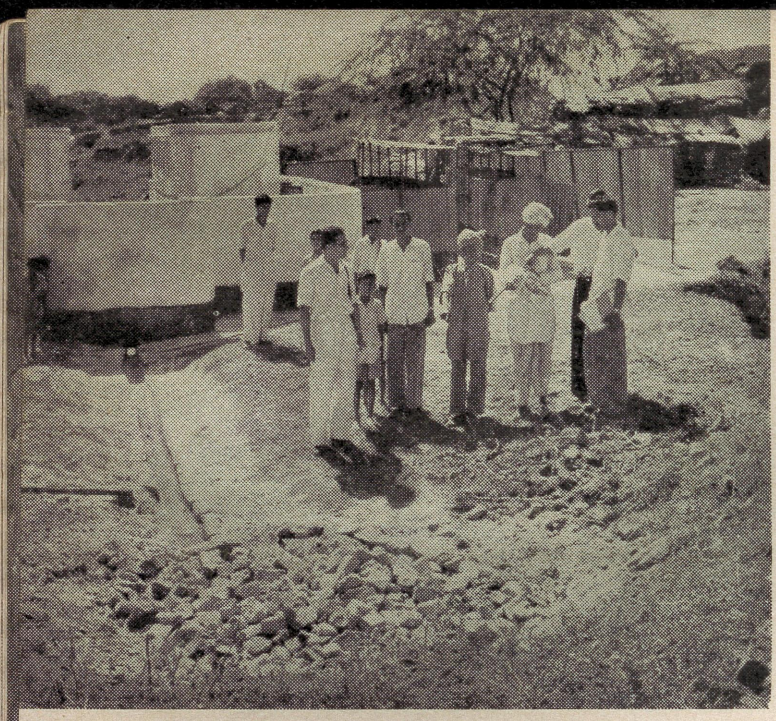
Sanitary Latrines solve a health problem

A clean village is a healthy village



Dustbins for collection of rubbish and refuse

The cleanest village gets the award



Disposal of liequid waste in village

transferred directly on the individual house holder in the village instead of allowing it to gather size and momentum as a community problem. What is required is a well-knit effective unitary agency which can educate, advise and help the house-owner to provide such facilities at his own cost and maintain them in a good condition, in his own and in the community's interests.

Urban Civic Needs

The problem however, assumes a different proportion when it impinges on the urban areas crowding is a chronic feature of urban housing. Unplanned developments are equally chronic. The urban citizen is constantly creating civic problems for himself, his neighbour and the local body representing the urban community. The powers and the financial resources of the local body are usually restricted when compared to their responsibilities in solving their civic problems. Urban water supply and sanitation schemes are the primary responsibilities of the local bodies. But very few local bodies have discharged their responsibilities in this direction satisfactorily in the past few decades. The provision of a safe drinking water supply—an essential civic need of any civilised community—has itself not received adequate attention in many urban areas. Most often, the State Government have to step into the picture and help the local bodies with grants-in-aid to install protected water supply systems for the urban populations. Local bodies have seldom taken to such projects as a business proposition. Instead, they look upon the Government as a compulsory partner in the provision of such amenities. When a water supply system is partly contributed to by the local Government, its subsequent maintenance by the local body is not efficient. So much so, when the time comes for a replacement of the installation to suit increased demands from the population, the local body has to go out again for financial succour.

Water Supply and Sewerage

Such being the case in regard to water supply systems, the position is much worse in regard to sewerage schemes. The provision of a water supply system automatically brings in its wake the problem of waste water disposal. But most of the local bodies can hardly afford to finance their sewerage schemes in addition to the water supply system. So much so, insanitation due to stagnation of liquid wastes from house-holds and industries causes increased mosquito nuisance in all urban areas and accentuates filarial conditions.

A few towns toyed with the idea of providing a surface open drain system to deal with their stagnant sullage as a cheaper solution than the provision of a sewerage system. The results, however, have not always been commensurate with the capital investment involved in such part-utility schemes. It was at best but a partial solution to the problem. it also engendered a false sense of security.

Finance

Drainage and sewerage systems must form the main plank of attack against filth-borne diseases and more particularly filariasis in our urban areas. How then is it accomplished. The financing of such costly schemes is a main factor at present against their non-implementation. Even in urban areas where filariasis is endemic to a "highly alarming" degree, and where the local population is aware that the only solution lies in the provision of drainage and sewerage system for the local areas, the Municipality would seem to feel helpless against the financial commitments involved. Even though loans are offered by the Central Health Ministry for prosecuting urban water supply and sewerage schemes

under the National Water Supply and Sanitation Programme, local bodies hesitate to promote urban sewerage schemes because such schemes are not self-supporting in the sense that a water supply scheme is. As local bodies do not expect to get adequate monetary returns or income from a sewerage scheme such as would repay the loan necessary to install the scheme, the progress in this direction will not be encouraging.

In many municipal areas, the revenue returns realisable by the sale of water, as such, is a new idea by itslef. In the case of a sewerage scheme, however, the only direct and visible means of returns realisable by a local body is the income from a sewage farm if one exists, as also the income from digested sludge and sludge gas, if they form part of the treatment plant. The income from these sources, even if realised, forms but an insignificant part of the capital cost of installation of a sewerage system. Apart from the heavy capital cost of the installation, a sewerage scheme also imposes a heavy expenditure on the local body for maintaining sewers and appurtenances, running the pumping stations and operating the treatment plants. So much so, under the present concept of returns, on the cost of projects, local bodies have found that sewerage projects are the least remunerative in terms of visible money values, and this explains the reason why local bodies are unable to promote sewerage schemes with as much facility as they do water supply schemes even under present conditions of financing. It also explains why urban sewerage schemes make no headway even where the need therefore, is pronouncedly felt.

Combined Utility Projects

But the installation of a water supply scheme in any urban area makes a sewerage scheme for that area unavoidable. With the installation of a water supply system alone and without a sewerage scheme as a complement, the urban area may be said to have escaped water-borne diseases only to face accentuated insanitation and the diseases resulting from them. Naturally, therefore, local bodies will have to face and solve the problem of urban insanitation and provide a sewerage system as an essential civic amenity, sooner than later. For them to be able to do so, it is necessary to review the question of financing of water supply and sewerage schemes on a more realistic basis and as mutually dependent and inseparable amenities in any urban unit. The success achieved in the more advanced countries is due to realisation of this factor which enables them to treat water supply and sanitation schemes as combined utility projects financed on a common basis.

Gainful Investment

Once it is accepted that a sewerage scheme for urban areas cannot bear any postponement long after the completion of the water supply scheme and that a sewerage system is an inescapable adjunct to a water supply scheme, the financial implications involved may have to be reviewed from a different angle. Apart from the physical assessment of the debit and credit sides of water supply and sewerage undertakings, based on the direct benefits accruing therefrom to the population, the invisible and indirect benefits which these amenities confer on the communities are too important and tangible to be ignored. The invisible benefit of a water supply scheme, namely, immunity from water-borne disease, is universally recognised, but is seldom equated in the shape of its monetary value due to the increased well-being of the community, a higher manpower potential and a reduction in the medical bills for the individual and the States.

The visible return from a sewerage scheme, however, is not as substantial or attractive as in the case of a water supply scheme or an electrical undertaking. But the provision of a sewerage system for a town confers several indirect and invisible benefits. It will do away with the need for maintaining an army of people engaged in the unpleasant task of nightsoil conservancy, transport and disposal; maintaining long lengths of earthen drains or sullage carriers doing service as elongated cesspools all over the town, and maintaining crews of public health personnel to oil and spray nuisance spots in the town to mitigate mosquito nuisance. It will save a heavy and recurring annual expenditure on anti-malarial, anti-filarial and anti-mosquito measures. Because of the improved sanitation in the area it will reduce the medical bill of the individual families and likewise reduce the medical bills to the municipal-and State-maintained hospitals. A reduction in the mortality and morbidity rates in urban areas will simultaneously help in the more rapid and effective advancement of the nation in the industrial and

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WATER SUPPLY AND SANITATION—ACHIEVEMENTS AND FUTURE PROGRAMME

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WATER and filth-borne diseases contribute to the major proportion of the mortality and morbidity rates among the country's population. The Health Survey and Development Committee for the first time laid special emphasis on the preventive aspect of health and recommended a high priority for environmental sanitation. It was, however, the subsequent Environmental Hygiene Committee in 1949 that made a comprehensive survey of the subject and made specific proposals both for short-term and long-range activities in this field.

Soon after, the various States in the country made their own plans for the provision of safe water and the improvement of environmental sanitation in both urban and rural areas as part of their Five Year Plans. The progress, however, was not adequate mainly because of paucity of funds, materials and technical personnel.

National Programme

In view of these difficulties, the Central Ministry of Health launched the National Water Supply and Sanitation Programme in the latter half of 1954. The aim of this Programme was to assist the State Governments in the rapid implementation of the water supply and sanitation projects in both urban and rural areas.

Financial Aid

Under the Programme, the Central Ministry of Health offers financial assistance in the form of long-term interest-bearing loans for urban water supply and sewerage schemes and a 50 per cent grant-in-aid for rural water supply and sanitation works. The other 50 per cent is made up of grants from the State Government concerned and the villager's contributions. In order to qualify for this assistance, the State Governments are required to send the schemes of water supply and sanitation for approval by the Ministry of Health. Areas where acute water shortage exists and where cholera, typhoid and other water and filth-borne diseases are prevalent are given priority for assistance.

Technical Service

A nucleus of a Public Health Engineering Organisation was set up at the Centre in order to render technical help to the States whenever necessary. In the beginning, the Government of India procured from USA materials and equipment worth about Rs three crores.

Training of Personnel

A provision of Rs 50 lakhs was made in the Second Plan under the National Water Supply and Sanitation Programme for the training of public health engineers, engineering subordinates, sanitary inspectors and waterworks plant operators. Under this scheme, engineers and subordinates are trained at the Engineering Colleges at Guindy (Madras), Roorkee (U.P.) and at the All-India Institute of Hygiene and Public Health, Calcutta. Subsidies are sanctioned to these three institutions and stipends are paid to the State-sponsored trainees. Courses for sanitary inspectors and waterworks plant operators are conducted by the Central Public Health Engineering Organization at regional centres.

Achievements

During the First Plan period, Rs 12.72 crores and Rs 6 crores were set apart by the Central Ministry of Health under the urban and rural phases of the National Water Supply & Sanitation Programme. Two hundred and fifty-five urban water supply and drainage schemes estimated to cost Rs 45 crores

and 133 rural water supply and sanitation schemes estimated to cost Rs 13.5 crores were approved by the Health Ministry for grant and financial assistance.

When the Second Plan was announced, there was a provision of Rs 63 crores and Rs 28 crores respectively for urban and rural phases of the Programme. Two hundred and forty-two urban water supply and sewerage schemes as well as 216 rural water supply and sanitation schemes estimated to cost Rs 43 crores and Rs 5.76 crores respectively were approved.

Loans amounting to Rs 52 crores for the urban schemes and grants amounting to Rs 11 crores for the rural schemes have been paid by the Central Government during the First and Second Five Year Plans.

The urban projects which have been completed and which have reached a stage of self-sufficiency by the end of Second Plan period benefits approximately a population of 15 million. The rural schemes included under the Programme cover about 14,700 villages.

Training Programme

In all, 164 engineers in post-graduate courses, 95 engineers and 276 engineering subordinates in short-term courses, and 27 sanitary inspectors and 79 waterworks plant operators in special courses suitably designed for the purpose, were trained during the Second Plan period under the Programme.

Materials and Equipment

Under the Indo-U.S. Operational Agreement No. 25, a number of well-drilling rigs, windmill pumping sets, pumpsets, jeeps, trucks, engineering kits as well as a large quantity of cast iron pipes and specials worth about three crores of rupees were procured from abroad and distributed to the various State Governments. Indigenous production of scarce materials like cast iron pipes and specials is also being stepped up.

Role of other Agencies

Other agencies which carry out rural water supply works all over the country are the Departments of Community Development, Local Development and Tribal welfare. All these agencies carry out simpler types of rural water supply schemes.

The Community Development Programme envisages construction of new wells in areas where they do not exist and renovating existing wells with a view to make them safe. During the period—October 1952 to March 1961—216,500 new drinking water wells were constructed and 311,800 existing wells renovated, within the Community Development Blocks all over the country.

The local Development Programme aims at similar works but outside the Community Development Blocks. The amounts spent on rural water supply during the First and the Second Plans are Rs 15 crores and about Rs 18 crores respectively.

The tribal Welfare Programme has under its scope provision of water supply facilities to the scheduled classes, scheduled tribes, etc. It is estimated that newly constructed wells and renovated wells during the past few years total to about 20,000.

Future Programme

The achievement in regard to provision of water supply and sanitation is only a fraction of the major task lying ahead. A provision of Rs 89 crores for the urban water supply and sewerage schemes and Rs 16 crores for the rural water supply and sanitation works has been made under the National Water Supply and Sanitation Programme for the Third Plan period. Further, a sum of Rs 51 crores has also been provided for implementing rural water supply works under the three other programmes mentioned earlier.

It has been estimated that about Rs 900 crores would be needed to complete water supply and sewerage schemes for the urban population lacking these facilities as well as to carry out additions and improvements to the existing facilities, wherever necessary. The amount needed to provide water supply and sanitation facilities for the entire rural population is estimated to be of the order of Rs 600 crores. The above rough estimates are based on the 1951 census population.

Based on the foregoing consideration if the entire community is to be served with water supply and

sanitation facilities in the course of the next three decades, the annual expenditure on urban and rural projects should be of the order of Rs 50 crores. If the increase in population during the period is taken into consideration, as it should be, the annual requirement should be of the order of 70 to 80 crores of rupees. To expect the Governments to make such large amounts of money available would be unrealistic and hence a rethinking on the subject is necessary. The best approach is to enable the local bodies to operate water supply and sanitation utilities as self-supporting undertakings. The people should learn to demand these amenities and to pay for them. The local bodies should be enabled to raise the money required from the open market.

Simultaneously, it is also necessary to build up a technical organisation that can execute the works effectively and rapidly. This needs the setting up of strong Public Health Engineering Organisations at the Centre and at State levels and an accelerated programme of training of technical personnel at all levels.

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engaging the attention of scientists and engineers but this is still at an experimental stage and the cost is prohibitive.

A water supply that is adequate in quantity and satisfactory in quality, is an essential amenity and hence, it is necessary to make plans well ahead for providing this amenity. Naturally occurring water often requires treatment to render it fit for drinking. Such treatment is aimed at rendering the water "aesthetically satisfactory and epidemiologically safe". The possible approaches in providing "protected water supplies" to rural and urban areas and the several problems encountered in water treatment have been dealt with in the foregoing pages.

Polluted water can cause severe outbreaks of epidemic diseases. Every care has to be taken to see that the wells yield safe water. When we are dealing with surface supplies, it is necessary to ensure that the treatment is adequate and effective so that the water, as it reaches the consumer, is *always* of a safe quality. The operator has to be ever vigilant as any lapse on his part, can result in the outbreak of disease. The operator has to be well-trained for his job and should realise that he is the guardian of the health of the community he serves.

Provision of protected water supplies is a very important phase in our programme for building a healthier India. Considering the vastness of the country and our limited resources, the task is admittedly colossal. Nevertheless, the overwhelming importance of the subject, makes it inescapable that this subject should receive a high priority in our Plans for the reconstruction of the country.

RELATIVE ROLES OF HEALTH AND ENGINEERING PERSONNEL

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WATER supply and sanitation schemes occupy an important place among the health programmes under India's Five Year Plans. From a token provision in the First Five Year Plan, the provision for Water Supply and Sanitation Schemes has been increased to roughly a third of the total allocation for health schemes in the subsequent plans. The Third Plan has a provision of about Rs 89 crores and Rs 16 crores for the urban and rural water supply and sanitation schemes respectively under the health budget. Even so, it is only a small fraction of the amount needed for fulfilling the tremendous task awaiting accomplishment in this field. It has been estimated that an outlay of about Rs 900 crores would be needed to provide water supply and underground drainage schemes in all our urban areas and a further sum of about Rs 600 crores may be needed for rural water supply and sanitation schemes. This estimate indicates only the initial expenditure required to provide these facilities in the first instance. The cost of replacing or renewing these schemes after their useful period of life would be a recurring capital outlay at periodic intervals.

Public Health Engineers

The successful implementation of a programme of this magnitude over a period of years, demands the employment of qualified public health engineering personnel in suitable organisations. With the announcement of the National Water Supply and Sanitation Programme in 1954, the Central Public Health Engineering Organisation was created as a wing of the Directorate General of Health Services under the Union Ministry of Health. Public health engineering departments now exist in most of the States and it is only a matter of time before such independent departments are established in all the States.

The public health engineer, besides being a master of egineering techniques. has to be well-informed in the fundamentals of public health if he is to employ his techniques purposefully to realise public health objectives.

Public health engineering includes in its purview all essential activities bearing on the environment of man, *viz.*, town and village planning, housing, rural, urban and industrial safe water supply, collection and disposal of community wastes, prevention of river, beach and air pollution, control of industrial and trade wastes, milk and food sanitation, radiological health, etc.

The Public Health Engineering training programme taken up as a part of the National Water Supply and Sanitation Programme has helped to train some 600 engineers and subordinate engineering staff in this specialised field. A corps of engineering personnel for carrying out environmental sanitation programmes has been thus created by giving specialised training in public health engineering to those having basic training in civil engineering.

With the Engineering personnel and organisation thus placed on a proper footing for carrying out environmental sanitation activities, the relative role of the health and engineering personnel in fostering public health in the country assumes an importance of its own.

Role of Engineering and Health Personnel

The maintenance of health depends on personal health services as well as impersonal health services, *i.e.*, environmental hygiene. While the medical officer, of health is alone competent to give the former, the

atter calls for the services of a public health engineer who alone is qualified to render it.

This delineation of responsibilities is quite clear and should be respected while carrying out the respective functions. Public health is the objective and engineering is the technique or method of this service.

Urban water supply problems, for example, are by and large of an engineering nature, the engineer being responsible for the investigation, design, construction and maintenance of the water supply system. The public health problems associated with it and the methods of control are well known. The medical officer of health can, however, assist the public health engineer in the selection of the source of the water supply scheme by identifying the existing health hazards, if any and indicating the preference between possible alternative sources. The public health engineer can utilise this information and arrange for the proper conservation of the source, where necessary and design the component parts of the scheme so as to eliminate dangers to health. Subsequently, also he ensures its operation and maintenance with due regard to sanitary principles. Any change of sanitary significance noticed during the routine analysis of the water is reported by the medical officer of health so that the public health engineer may adopt appropriate measures to ensure the safety of the supply.

Engineer and Sanitation

Urban sewerage and sewage disposal, refuse collection and disposal, cleansing, etc., are recognised engineering functions. But somehow, by tradition, the municipal officer of health is often placed in charge of refuse collection and disposal, cleansing, etc., which are functions foreign to his professional calling. This part of his work naturally claims considerable time and the longer he stays in this field the more divorced he becomes from the profession for which he is qualified.

By taking over these responsibilities on his shoulders, the public health engineer will enable the medical officer to devote his undivided attention to communicable disease control and other public health problems more germane to his profession. This may also contribute towards a better integration of the preventive and curative medical fields.

The collection and disposal of refuse and sewage involves, health hazards. Where sewage farming is practised, or where composting of nightsoil and refuse is in vogue, medical surveillance of the worker engaged in the operation becomes essential to ensure their health. Apart from this, the increase in fly-breeding, incidence of fly-borne infections, hookworm infestations, etc., are useful parameters for judging the efficiency of sanitary operations. The medical officer of health, keeping a close watch over the incidence of these infections and infestations in the community, can sound a timely warning to the engineer in charge of the operations so that he may exercise better control over the processes and the community does not suffer from increased morbidity and mortality.

Need for their Unison

One can thus visualise the medical officer of help as the watchdog of the health of the community and public health engineer as the responsible executive authority for implementing the programmes in a purposeful way in order to secure better health in the community. The two branches of the health services should thus work in unison at all stages like the two eyes of man.

Innumerable instances indicating the role of medical, health and health engineering personnel in urban sanitation programmes can be given. Apart from the direct fields of activity, there are often indirect and indefinable ways in which these personnel can play significant roles. For instance, in the promotion of sewerage schemes in urban areas, there is need to educate the community regarding the public health benefits that accrue from the sewerage scheme. While the urban dweller is anxious to get rid of the sewage from his home, he is averse to paying for it as a service since he does not recognise the corresponding benefits he gets in terms of better health. The proper collection and collation of statistical data regarding reduced morbidity and mortality, saving in hospital expenses, mosquito control measures, the labour employed for cleansing, etc., consequent on the introduction of the sewerage scheme and assessing these benefits in terms of money values is a necessary and important task in promoting this part of the programme. In this, all the members of the public health team have a vital role to play, depending on their own training and

professional background, in getting the necessary public support and sympathy for the project.

Rural Water Supply and Sanitation

The task of providing adequate supply of safe drinking water to the entire rural population within a foreseeable future is one of unprecedented magnitude. The role of the engineer in this field begins with an assessment of the problem to decide on the development of sources of water supply to suit local conditions and preparation of plans and estimates. Schemes which require a measure of engineering skill in the execution such as piped water supply schemes, tube-wells with power-pumps, etc., should necessarily be the responsibility of the public health engineer. Simpler schemes, such as wells with hand pumps can be carried out by employing suitably trained sanitary inspectors under the technical supervision of the public health engineer.

On the rural sanitation side, a design for a simple, cheap and saitsfactory type of sanitary latrine that is acceptable to the villages has been evolved and its adoption on a larger scale is now to be promoted. Here again, the engineer can arrange for the manufacture of the water-seal latrine slabs but the actual installation can be handled by the sanitary inspectors trained in environmental sanitation. The engineer can build the facilities required. Health education wlll create an awareness of the facilities which the villager lacks and which are essential to him and prepare the ground for the acceptance of the facilities in the rural areas and their maintenance in a satisfactory manner. Apart from the engineering and public health considerations, the economic level of the villager and his social awreness of the problem have also to be reckoned with in promoting the programme. The water supply and sanitation programme is basic to all other health improvements in the rural areas, and all the public health workers in the field have a duty towards the promotion of these facilities.

Future Programme

A good beginning has been made with the inauguration of the National Water Supply and Sanitation Programme for urban and rural areas but a vast field yet remains to be covered. Water resources conservation and water pollution control are related subjects which are gaining importance. Other general sanitation activities, such as hygiene of the houses, school and institutional sanitation, industrial sanitation, milk and food sanitation, etc., are yet to be tackled with equal vigour and organised efforts. in all these activities the objective is improvement of public health and the techniques used are essentially of an engineering nature. Hence, the need for an integrated approach to the problems by personnel having the necessary professional background to fulfil their respective roles relating to the public health and engineering aspects of the programmes.

With the rapid advances in science and technology, newer and more complex problems in environmental sanitation with more subtle and far-reaching consequences are continuously being created, as for example the problems associated with atmoic energy which have opened up a whole new field in environmental sanitation.

In the search for better and more economical solutions to these problems one feels more and more the need for collaborative effort not only by the professional medical and engineering personnel but also by scientists from different disciplines. We need each other, more than even before, in the initiation, promotion, implementation and sustenance of the environmental sanitation programmes in future.

PROBLEMS IN MAINTENANCE OF WATER SUPPLY AND SEWERAGE

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MAINTENANCE in general relates to the work of keeping any installed facility in a working condition for the benefit of the people for whom it is intended. It may be preventive maintenance which constitutes work and precautions taken to prevent any breakdown of the facility or corrective maintenance which constitutes work of repairs after a breakdown has occurred. Preventive maintenance is more economical and provides reliability in operation of the facility. Even so, corrective maintenance should be provided for as breakdowns are also possible.

Maintenance also helps to protect the capital investment and ensures an effective and economical expenditure in operating the facility. It also helps to build up and sustain cordial relations with the public whose understanding and support are essential for the success of the facility.

Knowledge of Design and Execution Needed

The person in charge of the maintenance of a water supply, sewerage and sewage treatment receives the system with its plants, devices and appurtenances installed for him by the designer and assumes responsibility to make them function satisfactorily for the benefit of the community.

Organisational Set-up

The existing organisational set-up for the maintenance of these facilities is not conducive to efficient maintenance. The facilities are, at present, initiated for the local bodies mainly by the engineers of the State organisations who investigate, design and execute them and then hand them over for maintenance to the local bodies. Even so, the work of design and execution are also done in separate branches of the Public Works Department in some States. The engineer in charge of maintenance belongs to a separate service which is divorced from the design and execution of the facility. He may not be aware of the intricacies of the design, the special features of execution, etc., without which he cannot appreciate the problems that may arise during their maintenance.

He is not also in a position to control effectively his subordinate staff as the services of such a staff are not provincialised but belong to the local bodies. This procedure again is not conducive to the satisfactory maintenance of the schemes.

Financing

Coming to the existing patterns of financing and accounting, it can be said that they are not conducive to effective maintenance.

The installation of these facilities is usually authorised by the provisions under the various Local Boards Acts and Public Health Acts of the State Governments. To finance such projects in the case of a municipality, it levies water and drainage tax on the basis of the annual rental value of the property and earmarks the income under this Head for the specific purpose. In the case of local boards, the general house tax is made to include provision for such water and drainage facilities and the local body may earmark a portion of its general revenue for the specific purpose of providing the water supply or drainage facility. The State Governments may also give a grant and/or loan towards the financing of such projects.

Once a water supply project is executed, the expenditure on its maintenance is merged with the general expenditure of the local bodies and no attempt

is made to treat the revenue and the expenditure on the facility as those of any isolated remunerative undertaking or industry. The maintenance engineer is also generally divorced from the demand and collection of the water revenues which are attended to by the Executive Auhthority of the Local Body. Thus, there is no incentive on the part of the maintenance engineer to correlate the water revenues with the maintenance expenditure of the project so that it may be efficient and self supporting. The local body exercises its control over the supply and charges for it. Where rural schemes are financed entirely from Government funds and the villagers do not participate, the latter usually consider it is the Government's concern to maintain the scheme also.

Lack of In-service Training

The maintenance engineer has not only to be a technical man but has to deal with human relations in order to be successful in his maintenance work. Lack of in-service training to improve the technical features of the programme based on the latest trends in other parts of the country and the world, and failure to develop a better understanding of human relations as also lack of development of the concept of "Service to the community", usually results in the maintenance engineer becoming unpopular. The usual remedy in such cases is just a transfer of the engineer to another local body and this symptomatic treatment does not usually remedy the root cause of the trouble.

Laboratory Facilities

Though it is generally accepted that suitable laboratory facilities are essential in any water or sewage treatment process, yet for want of effective enforcement, many water or sewage plants are either not provided with these facilities or are not controlled properly for want of intelligent appreciation of the tests or for want of qualified personnel to conduct them.

Analyses and tests are necessary to control the operation of the plant, to record and improve its performance, and undertake fundamental research.

Tests to control operation of the plant enable the preparing of water or sewage for each key step in the treatment process, help to economise in the use of chemicals, prevent wastage of materials, time and man-power. They help to achieve the standards expected of the product at each stage of the treatment and in the end as well.

In the case of a water facility, the tests help timely precautions to be taken to prevent any undesirable effect on the consuming public. They help to locate the source of trouble and to effectively deal with it. Thus, systematic conduct of tests in a well-equipped laboratory by properly trained personnel can create and infuse confidence in the public that all is well with the facility.

Problems in Rural Systems

The rural water supply is mainly from well fitted with hand pumps and these are not well cared for and the people are frorced to seek alternate unsafe water supplies. Where some public fountains are provided, they are either not fitted with waste-not taps or their waste-not action is defeated. The reason for the latter is due to several local arrangements because of the poor supply through the taps and also because people have to wait for a long time to collect a potful of water.

In the case of rural sanitation facilities, lack of proper care and maintenance of these will defeat the very purpose of installing these facilities. If the hand-flushed latrines are not well-maintaned, they will help fly-breeding and prevent these latrines from being used by the people. If the septic tanks or similar installations, where the digestion of the night-soil collected from the latrine is allowed to take place, are not cleared of the accumulated digested sludge in time, the effluent is likely to carry the sludge with it and choke the pores of the soil absorption system. This will eventually affect the purification of the effluent by creating waterlogging conditions. Proper diversion of the effluent into alternate fields in time will keep the system in proper functioning. If proper attention to these maintenance problems is not paid in time, the utility of these facilities will be lost and the expenditure will become infructuous.

Suggestions for Effective Maintenance

Provision of water supply and sewerage facilities should be entrusted to an independent body like the Regional or Metropolitan Water Supply and

Sewerage Boards so that these facilities may be installed and maintained by bodies inedependent of local influence.

The facilities should be financed solely on a self-supporting basis treating water supply and sewerage facilities as joint schemes by floating revenue bonds which will not be a tax burden on the public and which could be retired from the revenues from the facilities.

The designs should be carefully made to avoid all possible contamination of the water supply by cross correction, etc.

All urban water supply should be metered and no free supply should be given to any building or any community. Even if some supply is to be given to some public fountains, the local body should pay for it.

Where suitable staff is available for tackling the distribution of the supply to a town, the supply may be made in bulk by the Regional and Metropolitan Boards.

The work of design, execution and maintenance of all schemes should preferably be entrusted to a single agency and the engineers given facility to gain experience in each field by rotation.

The services of engineers and subordinate staff in any State should be provincialised to avoid stagnation of any personnel in a particular place for ever and to keep them free form local influence.

In-service training may be arranged for all the staff by the State Government making use of the training facilities offered by the Central Ministry of Health in regard to waterworks plant operators.

Suitable laboratory facilities must be provided in all water and sewage treatment works and proper records maintained.

The adage—"A stitch in time saves nine"—should be borne in mind in dealing with day-to-day maintenace work.

Wastage of water should be prevented by fitting up waste-not taps and making frequent inspections.

All rural schemes should be maintained by the local bodies concerned and suitable staff must be appointed for periodical maintenance of the pumps and other installations. The fittings should be standardised and enough spares should be kept in stock by the local body to effect prompt repairs.

Alternative drawal of water by rope and bucket must be made at each well fitted with a hand pump as this is better than driving the villagers to an unsafe water source in the village during an emergency.

Standard sets of instructions for the maintenance of several components of any water supply or sewerage facility must be prepared so that any particular item may not go by default. Such instructions must be displayed prominently at the concerned places.

All safety precautions should be taken to guard the operating personnel and the staff must be given training in first-aid and fire-fighting.

The frequency of routine inspection may be decided by the Chief Maintenance Engineer for all the subordinate staff and close supervision may be exercised to see that the maintenance work is carried out effectively and efficiently.

The data collected from the several projects, may be compiled and circulated to all the engineers for their benefit.

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agricultural fields. All these benefits must be assessed in terms of money value in order to equate the advantages which a sewerage project confers on the community. If all these invisible benefits are assessed financially and equated against the returns from sewerage schemes and corresponding credit allowed on the annuities due against the capital cost of the scheme it should be possible to bring sewerage schemes also within the field of remunerative enterprises to a large extent than it is possible at present.

In any case, such a re-assessment of values is not only rational but is necessary in order to place the financial aspects relating to water supply and sewerage scheme in their proper perspective. It is in the power of the local bodies to keep their towns free from insanitation and they require guidance and leadership in setting about this task.

SELF HELP IS THE BEST HELP

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ACT I—SCENE 1

Special Meeting of the Paradheenpur Municipal Council in the City Council Hall.

Present : Mayor and Councillors; (of the Nagarseva Party, the Jagrat Party, and the Lokhita Party): Municipal Commissioner, Engineer, Health Officer; the press and the public.

Mayor : The Council will now take up for consideration the latest Government order received from the State Government on the subject of our city's water supply improvements scheme. The large attendance in the public gallery today signifies the urgency and importance of the subject for our city. This is what the Government Order says :

"Sub : Paradheenpur Municipal Council—Water Supply Improvements Scheme—Council's request for 2/3 grant—negatived.

Read : From the Paradheenpur Municipal Council Letter 3789-L1-Dt. 15-1-1951.
From the Chief Engineer (P.H.) letter 4989-W.S., Dated 28-5-1955.
From the Paradheenpur Municipal Council Letter 3789-L2 Dt. 15-2-1956.
From the Inspector of Municipal Councils L. Dis. 37547 Dt. 7-8-1958.
From the Paradheenpur Municipal Council 3789-L.3. Dt. 3-12-1959.
G.O.No. 42352-L.A. Dt. 10-5-1961.

ORDER

The Government have carefully considered the request of the Paradheenpur Municipal Council for a two-thirds grant-in-aid from the Government to finance the city's water supply improvements scheme. The Chief Engineer reported that the scheme is estimated to cost Rs 15.5 lakhs to install and Rs 18,000 as additional recurring charges. The Municipal Council, after repeated consideration of the subject resolved to raise the property tax by two per cent. and also divert another three per cent. from its general funds to the water supply and drainage account, by which means it could meet only 1/3 of the capital cost of the proposed scheme and also the additional recurring charges. The Government regret that under the present financial stringency they are unable to provide for a grant-in-aid for the scheme. Moreover, the scheme has a low rank in the State Priority List for urban water supply and sewerage schemes. In the circumstances, the scheme will be postponed unless the Municipal Council can finance it from its own resources."

I am sure the Council shares may deep disappointment over this unsympathetic attitude of the Government in a matter which is so vitally important to us all.

N. Party Leader : Mayor Sir, my party is shocked at the callous manner in which the Government have dealt with the Council's request. It is now ten years since we began agitating for this improvement scheme. And yet we are still in the same position. If they are not in earnest about the matter why did the Government ask us in 1952 to deposit the centage charges for preparing the plans and estimates and raise false hopes in us ? The improvements to our water supply scheme are long over due. Unless we can persuade the Government to expedite it, the citizens would lose patience with us.

J. Party Leader : Mayor Sir, the position has now become almost impossible. We were proud of the fact that ours is the oldest municipality in the State. After years of agitation we succeeded in getting our water supply scheme executed in 1919. The scheme was then designed for a population of 40,000, at 15 gallons per head per day. Through the subsequent decades the scheme was not expanded and extended to meet the increased needs of the city. The scheme has also become ancient, like our Municipality. But the population has now exceeded the figure of 100,000. The southern and western extension areas of the town are practically without any protected water. The situation is getting from bad to worse. Unless the Government comes to our rescue and executes the improvement scheme forthwith. the Council may as well cease to exist.

L. Party Leader : Mayor Sir, our party at least is not surprised at the attitude of the Government. How can we expect them to help us unless we represent our case forcefully ? Only last year we had an epidemic of cholera in our southern extension area. The Varun Irrigation canal extension scheme had brought a feeder channel skirting our town and the residents of the area who had no piped supply freely resorted to the canal water. The epidemic was clearly traceable to this source. Thanks to the prompt and effective preventive measures of our Health Department the casualties were only 230 whereas the epidemic took a heavy toll in the neighbouring municipal town of Panisagar where there is no protected water supply at all. The Council will recall that we also passed a resolution at the time expressing our sympathy with the sister municipality over their heavy loss of human lives. But the upshot of it all was, that Municipal Council made a hue and cry over it, waited in deputation on the Government, and got their rank in the Priority list changed from 320 to 228. We do not know how to present our case effectively.

N. Party Leader : Mayor Sir, this advance of rank in the Priority list carries with it only a psychological solace. The Government have themselves stated that at the present rate of financial allocations under the Plan it may take some 50 years more to provide protected water supply to all the 357 urban bodies in the State. Changing the rank of Panisagar Water Supply Scheme from 320 to 228 would mean that the scheme may be taken up 35 years later instead of 42 years later. It is an unreal concession and nothing to enthuse over. And yet, the Binapani Municipal Council whose rank in the list was reduced from 228 to 320, to give place to Panisagar, has recently led a deputation to the Government to have its rank restored ! Let us be under no illusions about it; the so-called Priority List is a Master Plan for slow action and an instrument for negation of results. Let us fight for more tangible favours.

Mayor : This seems to be a council of despair; I mean, counsel of despair. We shall have to find some new arguments to press our case. Let us ask the Municipal Commissioner to explain our present ways and means position. Mr Commissioner, let us have the details.

Municipal Commissioner : Sir, as the Council is aware the original scheme was itself installed with a 3/4 grant-in-aid from the Government. Subsequently through the years the Council has been giving house service connections which now stand at a total of 2,100. With each connection are given two taps free of charge. There are very few metered connections to industries and institutions. As the meters are all out of order we are levying nominal charges. The water and drainage tax receipts are sufficient just to meet the recurring maintenance charges on the water supply scheme and to meet the expenditure on conservancy, sullage drains, cleaning crews, anti-mosquito measures and preventive health measures in the areas unserved by the protected water supply system.

N. Party Member : Mayor Sir, the Com missioner forgets that the Council raised the property tax on his advice two years back.

Commissioner : Yes, 8ir, it did, but only after it had reduced the enhanced values I had proposed on property assessments in the quinquennial revision. So the increase in the property tax did not

increase the income to the municipality. The Health Officer, on the other hand, is insisting on increased provisions every year for preventive health measures.

Health Officer : Sir, if I may just explain. The old water supply scheme, inadequate though it is for the town, has created grave problems of insanitation for us. The town is flat and the waste water from several areas stagnates in elongated cesspools, becomes septic liquor, breeds mosquitoes and imperils the health of the residents. During the past few years, filariasis has become endemic in the town, and is spreading towards the neighbouring villages. Mosquito nuisance has become unbearable. Everybody says that while our neighbouring town Dugandh leads by its sheer number of mosquitoes, we lead by the size of our mosquitoes. The cleaning of the sullage drains, oiling and spraying, survey and surveillance measures are all mounting up in cost. Added to this, the expenditure on nightsoil conservancy, tansport and disposal is going up rapidly and is also getting out of control because the human element is rebelling against the degrading work. I am afraid the Council will have to consider seiously the provision of a sewerage system for the town without delay.

Mayor : Have we any idea of what such a scheme may cost ?

Municipal Engineer : Sir, the Chief Engineer. (Public Health), has reported that a sewerage scheme for our town at present day rates may cost roughly Rs 60.00 lakhs to install and Rs 1.7 lakhs to maintain annually.

J. Party Leader : Mayor Sir, it is all a staggering figure. The Council can never hope to undertake a scheme of such a magnitude. Even the water supply improvements scheme, after ten years of agitation and representation, seems to be beyond our reach now, urgent and imperative though it is. We need not reach for the moon yet. Let us insist on the Government helping us out with the water supply improvements first.

Mayor : Here we go again. We were discussing our ways and means position just for that purpose. Mr Commissioner, have you any further details in that connection ?

Commissioner: Sir, the Municipal Engineer has been suggesting that all house connections should be metered and a charge of Rs 0.75 per 1,000 gallons levied on the actual quantity consumed by each house. It is expected that this would immediately fetch an income of nearly Rs 75,000 per year on the existing connections alone. When the number increases later the income will.....

N. Party Leader : Mayor Sir, this is an unhelpful suggestion. It does not sympathise with the rate-payer's difficulties. When they are already paying water and drainage tax, how can we sell water ? Is not drinking water every body's birthright ? How can we allow the Government to fail in its primary duty to the citizen ? What are we paying taxes for ?

L. Party Leader : Mayor Sir, our party cannot accept such a suggestion either. The citizens have been enjoying free house taps all these years, ever since the very inception of the scheme. If, at this late stage, we propose to sell the water to our citizens, we shall get a bad name.

J. Party Leader : Mayor Sir, such a step would spell disaster. Even if we, their elected representatives, cannot render the rate-payer any service, we may at least refrain from doing them a disservice.

Mayor : I do not know whether maintenance of the *status quo* will not itself constitute a greater disservice to the rate payers. However, raising such new issues may be awkward just now. Let us then decide on the next course of action.

L. Party Leader : Mayor Sir, I move that the Council do present a welcome address to the State Development Minister when he visits this town next week to inaugurate our Health Week celebrations, and request the Government to speed up our water supply improvements scheme as a special case.

Mayor : I take it this is the unanimous opinion of the Council.

All : Yes, Sir.

Mayor : We shall do so. The meeting is adjourned.

ACT I—Scene 2

Presentation of Welcome Address to the State Development Minister by the Paradheenpur Municipal Council in the Council Hall.

Present : Development Minister, State Director of Health Sevices, District Officials, Municipal Mayor and Councillors and Officials, Press and public.

Development Minister : I am grateful for this address of welcome, from the oldest municipality of the State. Your city can rightly be proud of the fact that it has produced many prominent and leading men in the public life of the country. It is sad however that your city's water supply is unsatisfactory and its sanitation in a deplorable state. I realise your problems are urgent. I would support your request for a liberal grant-in-aid to my esteemed colleagues, the Local-Self Government Minister and the Health Minister. You will, of course, realise the Government's difficulties when they have to deal with scores of requests similar to yours. It seems to me, however, that you may lay urgently a small pipe line to the South extension area of the city, and give those residents at least a small quantity of protected supply to ward off the risk of an epidemic in future. It should not cost the Municipal Council any large amount.

Mayor : Sir, that idea did occur to this Council immediately after the last cholera epidemic. In its desperation, the Council had the work executed in spite of the warning of the Municipal Engineer. The people are now furious because every time they open the tap they get more air than water.

Minister : That only shows that your problem is more chronic and demands drastic remedies. The significance of the Health Week celebrations becomes all the more important for your city. I would advise, however, that the council should make an all-out effort to improve the water supply without too much dependence on the Government. You know that self help is the best help.

ACT II—Scene 1

Special meeting of the Swadheenpur Municipal Council in the City Council Hall.

Present : Municipal Mayor and Councillors (of the Conservative, Progressive and Radical Parties) Commissioner, Engineer, Health Officer; Press and the public.

Mayor : The Council has met to conduct an important business : As the members are aware, the Government have referred to us the schemes prepared by the Chief Engineer for our city's water supply improvements and for a sewerage scheme for the city and have sought our view as to how we propose to finance these schemes. The water supply improvements schemes is estimated to cost Rs 19.5 lakhs to install and Rs 15,000 to maintain annually. The sewerage scheme, however, will cost us as much as Rs 75.00 lakhs as capital outlay and Rs 1.38 lakhs to maintain annually.

Progressive Party Leader : Mr Mayor, these are pretty staggering figures considering our resources. No doubt the water charges realised on our house service connections are showing a steady and encouraging increase, ever since we metered all the connections and began billing for the actual quantities consumed. The rate payers who demurred to this new system first, have now realised that it is the most equitable way of sale and purchase of a commodity which costs money to produce it. The number of service connections has been steadily increasing as we closed down all superfluous public standposts. Altogether the Council may compliment itself on the bold decision it took four years ago, despite the gloomy forebodings of the Conservative party. The proposed improvements to our water supply scheme, when completed, would enable us to double, nay even treble, the number of house service connections in the city. This should give us a substantial increase in our water revenue. But how far it would help us in finding the money for the two schemes will have to be considered.

Radical Party Leader : Mayor Sir, the Commissioner's Note on the subject explains how the increased revenue from our service connections after the improvements scheme is completed, will help us to meet the amortised payments not only against the cost of that scheme but also against half the

capital outlay needed on our sewerage scheme as well. This method of sale of water to all the consumers on a slab rate of charges is proving to be a veritable Alladin's lamp to us. The Government would want to know how we can meet the other half of the cost of the sewerage scheme. The Commissioner and the Municipal Engineer have advocated an increase in the present rate per 1000 gallons of water to raise the additional annuity required. This may be too much for the consumers to bear. We can think of this step, if at all, as a last remedy and as a Hobson's choice. For the present, we shall point out to the Government that the Council hopes to find the additional payments by diverting our present expenses on conservancy, and on anti-mosquito and anti-filarial measures as such expenses will cease to exist on the provision of a sewerage system. This will help us to meet the amortisements against 1/4 of the cost of the sewerage scheme. We shall request the Government to help us with a grant of $\frac{1}{4}$ of the cost of the sewerage scheme as we have tried honestly to exploit all the resources available to us in this behalf. The Government should not mind giving us this quarter grant on our sewerage scheme either. as the scheme is going to reduce the sickness and morbidity rate among the people of this town and save for the Government a good portion of their current expenditure on hospitals and medical services for these people.

Mayor : It is indeed an intelligent and rational presentation of our case. The Council will be pleased to know that our State L.S.G. and Finance Ministers are quite complimentary to us on our progressive outlook in the financing of our schemes and expect us to provide the leadership for other municipalities.

Conservative Party Leader : Mr Mayor, it is premature to begin congratulating ourselves. I have considerable misgivings whether the financial forecasts indulged in by my friend would actually be realised in practice. We should go very slow and cautious in these matters. Where is the guarantee that our service connections will increase ? How are we sure that our sewerage scheme will .....

Radical Party : Mayor Sir, let me interrupt my friend, the prophet of doom. If we had listened to him four years back, we would never have gained all the advantages we have since then. We would perhaps be in the same unhappy and unenviable predicament in which the Paradheen Municipal Council finds itself at present. We have not yet forgotten all the gloomy forebodings expressed by the Conservative Party when our Council decided by a large majority to levy charges for the supply of water. Let not my friend begin to throw cold water again, and block the progress of our civic amenities.

Conservative Party : Mr Mayor, our anxiety is that we should not throw away the chances of securing from the Government a larger grant-in-aid than what we propose to seek now. When other municipalities are fighting for liberal grants-in-aid why should we volunteer with self-help ?

Radical Party : Mr Mayor, My friend forgets that fighting with the Government for grants-in-aid does not mean the securing of such aid. The fight is always one sided as the Government express their inability clearly and squarely. Of what avail has such agitation been to our neighbours—Paradheen Municipal Council, the Masakpur Municipal Council and others ? They are all feeling helpless, always approaching the Government with the mendicant's bowl and returning disappointed; and no progress made over the past two decades. Let us be practical and prove the value of self-help.

Mayor : Let us not enter into an argument over the obvious. I am sure our friend of the Conservative Party means well.

I take it the Council would like to pass a resolution accordingly for communicating to the Government and urging the early sanction and execution of the schemes.

All : Aye, aye.

Mayor : The meeting is now adjourned.

ACT III—Scene 1

State Government Secretariat—Enter deputationists from the Paradheenpur Municipal Council.

Present : State Health and L.S.G. Ministers, Secretaries to Government, Chief Engineer (Public Health) Director of Health Services and others.

Municipal Mayor and the three Party Leaders present a memorandum.

L.S.G. Minister : Your Council's request for a liberal grant towards your water supply improvements scheme has already been considered sympathetically by the Government. We are advised that the Municipal Council can improve its own financial resources by levying charges for supply of water and meet the cost of the scheme thereby. The Swadheenpur Municipality has been doing so for some years now with remarkable success and self-sufficiency. Other municipalities are also following suit. I would advise your Council also to try to become more self-reliant instead of depending on the Government for everything.

Deputationists : Sir, are we wrong in depending on the Government for the elementary rights of our citizens ? Is it not the Government's bounden duty to provide drinking water to the people free of cost ?

Health Minister : Execuse me, Mr Mayor, water is free at the rivers and lakes and underground. But when it is to be filtered, disinfected, pumped and distributed to the communities, the process costs quite a lot of money. If the Government are to do it for all towns, they have to use only the tax payer's money for the purpose. If the Government are asked to pay grants-in-aid for all water supply and sanitation schemes, they can do so only by raising the tax on the public. They take in by one hand and give out by the other. The Government is not a *Kalpataru*. In any case, the rate payer has to pay for his amenities, directly to the municipality or indirectly to the Government.

Mayor : In general, Sir, what you say sounds alright. But the Government should consider our Council's predicament now. For decades, our house-owners have been used to free water taps. If our Council were to start the imposition of tap rates, you can imagine the uproar it will create.

L.S.G. Minister : It is no doubt a bad legacy you have. But a good doctor can never get the credit unless he administers the bitter pill to cure a deepseated malady. Your Council has now the good opportunity to set right an impossible situation. You will have the Government's support in what you do.

Deputationists : Sir, this is but a counsel of perfection. We were hoping to get a more tangible measure of help from the Government. We understand the Central Government have made a large allocation for our State in the Third Plan. Cannot our Council be given a grant therefrom ?

Health Minister : The Central assistance is only by way of a loan for our urban schemes. If such loans were to be distributed as grants-in-aid from the State Government to all local bodies like yours, what is to become of our State's economy ?

Deputationists : But Sir, what the Central Government give you is our own money. Why should they call it a loan and insist on its return ?

Health Minister : I am afraid, Sir, your concept may wreck the Centre's economy as well. The technical experts estimate that our urban water supply and sewerage schemes cost roughly Rs 60 and Rs 80 *per capita*. Our country's economy is too poor for the Government to be able to make a free gift of Rs 140 to every urban citizen towards the provision of these amenities, essential though they are.

Deputationists : Sir, how then, can the poor Municipal Council afford to do what the Government cannot?

Health Minister : My dear Sir, you must not get frightened by the capital outlay involved in such schemes. Your concern is how to meet the amortised payments every year spread over the next 40 years or so. There is a pontential in every urban community for repayment of such annuity. Whether the local body taps this potential or the Government do it, is immaterial. The ability of the house-owner

to pay for the water he consumes forms such a potential. It is common knowledge that in every town where there is now no protected water supply, each house-owner is spending for securing the water needed by his household thrice or four times the amount paid by the corresponding house-owner in a town served by a protected supply. The citizens are always anxious to secure a good water supply system and an efficient sewerage system, the two forming their felt needs. They are also ready to pay for it based on the quantity actually used by each. Metered water charges and sewer rentals are the recognised methods of repayment of capital loans borrowed against these schemes. The Expert Committee who studied this subject in all its aspects has made the same recommendations; that water supply and sewerage scheme should be undertaken as a joint utility venture and as a self-paying business enterprise.

Deputationists : But Sir, the experts are led away by the glamour of conditions in the advanced Western countries and dream of a similar Utopia for our country. We understand that the *per capita* cost of such schemes in those countries is five times as much as it is in India, whereas the average *per capita* annual income is forty times that in India. May be our engineers may soon achieve parity in the cost of the schemes as between the two countries, but we can never hope to raise our *per capita* income to their standard in the immediate future.

Health Minister : Sir, there again you are mixing up the cart with the horse. Water supply schemes in the States, as you may know, are designed for a *per capita* supply of 200 gallons per day while we in India will be satisfied with 20 gallons. Our schemes must be made to suit our means. It is only the method and the principle we need copy from the more advanced countries. Your Council will be well advised to follow the example of the Swadheenpur Municipal Council in financing their water supply and sewerage schemes. The high capital cost of these schemes has not frightened that Council into a policy of inaction or dependence on the Government. We are going to help that Council with a loan for their two schemes just as we shall be prepared to help your Council too, if you are willing to be self-reliant. The Government will help those who help themselves.

Deputationists : The subject seems to be too complicated and the implications far-reaching. We shall discuss the matter again in our next Council meeting and seek your help again.

L.S.G. and Health Ministers : Please remember that self help is the best help.

Act III—Scene 2

Meeting of the *Paradheenpur* Municipal Council—Question time.

A Council Member : Is it a fact that the Swadheenpur Municipal town has got its water supply improvements scheme and sewerage scheme completed in record time, securing a loan assistance from the Government.

Mayor : Yes. We understand it is so. In fact it is reported that part of the loan required was raised in the open market with the support of the State Government.

Question : Is it a fact that our Municipal Council has woefully failed to secure any help from the Government for our city's water supply and sewerage schemes ; and the city is suffering from partial water scarcity and bad insanitation as a result of the Council's inaction over the past three decades ?

Answer : Yes. It is true we have made no progress. It is not due to want of action on our part. We made representations, presented welcome addresses and even waited in deputation on the State Minister, but all to no purpose.

Question : Why should the Swadheenpur Municipal Council succeed where we have failed so miserably ?

Answer : Perhaps it is because we have proved that dependence on others is suicidal while the other Council has demonstrated the adage —"Self help is the best help."

SMALLPOX AND CHOLERA

MORBIDITY AND MORTALITY

SIX thousand one hundred and fifty-nine cases of Smallpox with 1664 deaths were reported throughout India during June 1961. The cases and deaths of cholera were 4083 and 1134 respectively. There were no cases of plague during the month.

State	Cholera		Smallpox		Plague	
	Cases	*Deaths*	*Cases*	*Deaths*	*Cases*	*Deaths*
Andhra Pradesh	230	75	146	47	—	—
Assam	—	—	14	1	—	—
Bihar	1366	432	29	9	—	—
Delhi	—	—	3441	822	—	—
Gujarat	—	—	84	16	—	—
Himachal Pradesh	—	—	3	—	—	—
Jammu & Kashmir	@	@	@	@	@	@
Kerala	—	—	44	15	—	—
Madhya Pradesh	156	39	170	28	—	—
Madras	8	6	596	171	—	—
Maharashtra	@	@	@	@	@	@
Mysore	6	3	156	75	—	—
Manipur	—	—	—	—	—	—
Orissa	7	3	13	—	—	—
Pondicherry	—	—	53	27	—	—
Punjab	—	—	153	47	—	—
Rajasthan	—	—	325	88	—	—
Tripura	—	—	—	—	—	—
Uttar Pradesh	942	144	902	296	—	—
West Bengal	1368	432	30	22	—	—
Total :	4083	1134	6159	1664	—	—

@ Information not received.

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Community health	H
Depending on city's health	E
Dirty habits	H
Environmental sanitation	E
Fly about the house	E
Fly control	E
Eyes and their care	E
Good Health	H
Gram Saphai	H
If it is health you are seeking	E
Mr William wakes up	E
Out beyond the town	E
Personal hygiene	H
War that never ends	H
Why Willie was willing to wash	E
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Care of the eyes
Care of the feet
Care of the hair and nails
Care of the skin
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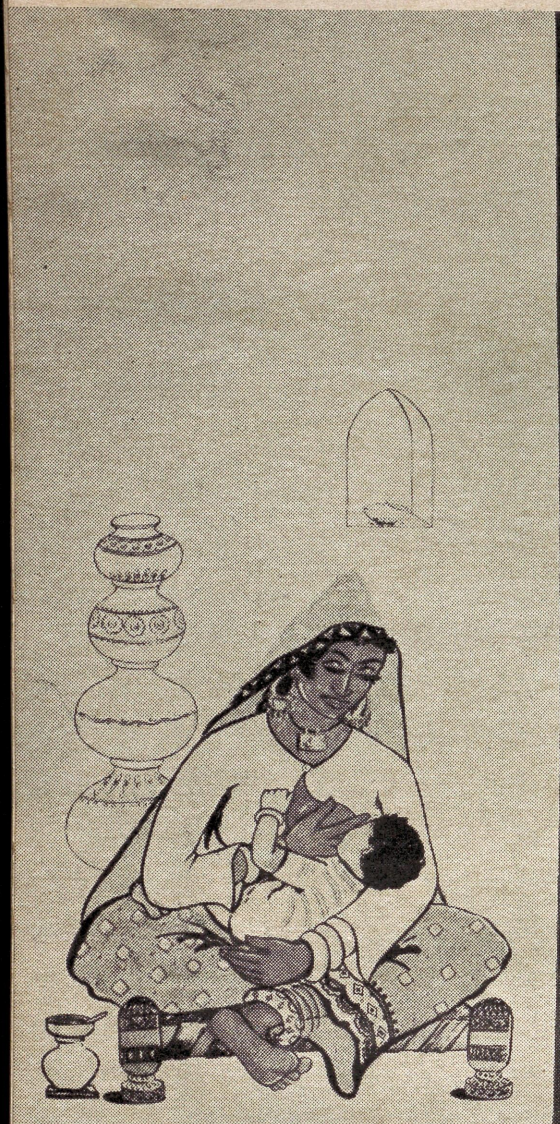

माँ का दूध
बच्चों के लिये सब से अच्छा है

BREAST MILK BEST FOR INFANTS

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