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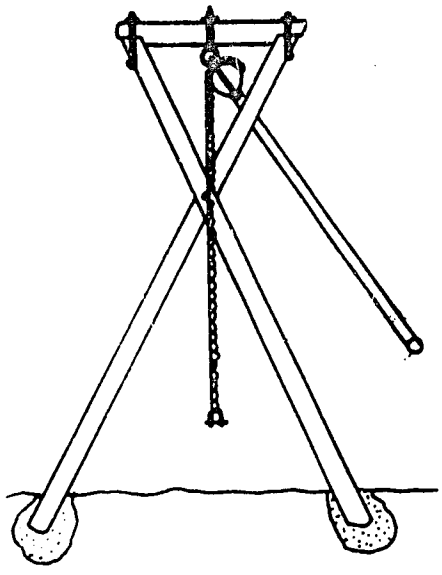
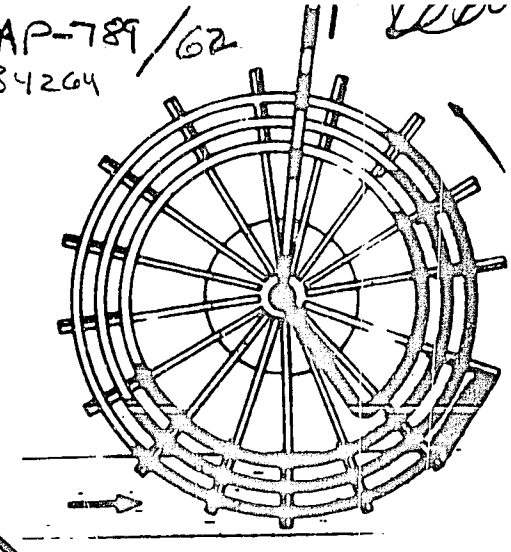


SWING PUMP



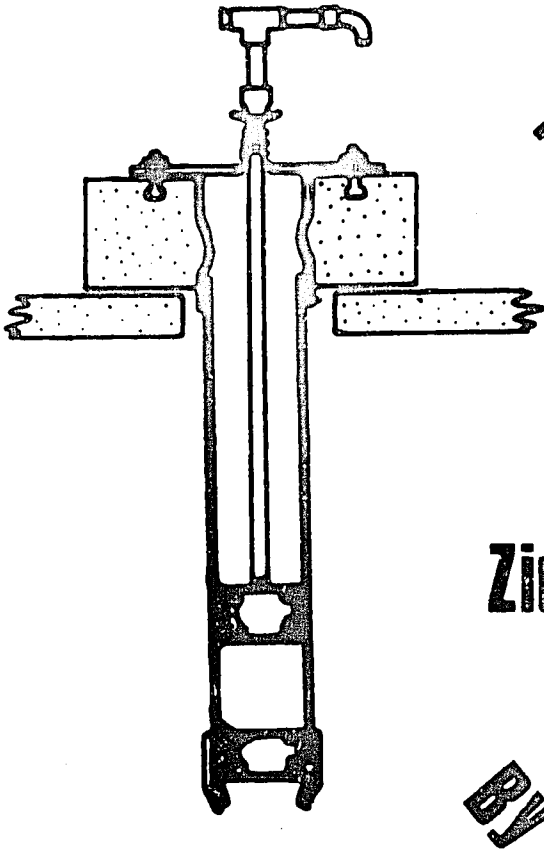
WATER WHEEL

Appropriate Technology for health in rural Zimbabwe

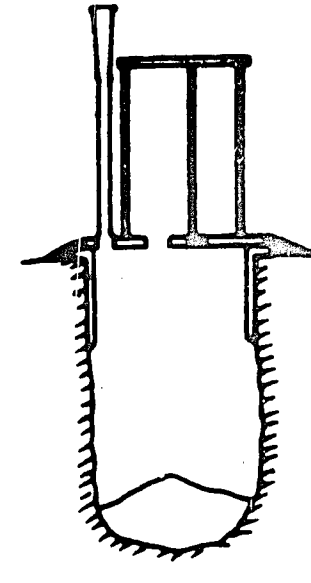
produced for

Zimbabwe International Trade Fair 1980

BY the ministry of health



HAND PUMP



VENTED PRIVY

RURAL HEALTH AND THE NEED FOR APPROPRIATE TECHNOLOGY - A WORLD PROBLEM.

Man can live in good health if the proper precautions are taken. The real answer lies in prevention, for although a good cure alleviates suffering, it costs far less in the long run to stop the disease spreading in the first place.

The importance of safe drinking water and sanitation in the control of such diseases as diarrhoea, typhoid and paratyphoid fever, cholera, infectious hepatitis, bilharzia and many others has been well established. However, according to a recent global survey conducted by the World Health Organisation, 78 per cent of the world's rural population is without reasonable access to safe and adequate water supply. International Health Organisations have shown many times that people provided with hygienic facilities are much healthier and happier than those with poor or inadequate facilities, and the United Nations has designated the 1980's as International Drinking Water Supply and Sanitation Decade - its motto being "Fresh Water for All by 1990".

Safe, adequate and accessible supplies of water, together with sanitation, are recognised as basic health needs and essential components of primary health care. Many of the diseases affecting underserved populations, especially the poor and slum dwellers, could be greatly reduced by meeting these basic health needs. Plentiful supplies of clean water help to decrease mortality and morbidity, in particular in infants and children, as well as making life easier for women.

In the world to-day, an astonishing number of people suffer from water-associated diseases at any one time: in round figures, there are 400 million with gastro-enteritis, and 200 million with bilharzia: Diarrhoeal diseases, especially among infants, constitute a major cause of death throughout the developing world.

It goes without saying, therefore, that in all rural and low-income regions, efforts should be directed to bringing abundant year round quantities of water close to where people live. It would also be wise to add that all water supplies, with the possible exception of underground water, should be treated or processed in some way to improve quality; such processing would pay additional dividends in improved health.

Best Available Document

However, it is one thing to say that health improves if adequate facilities are provided, but entirely another to actually suggest the type of facilities which are likely to be both acceptance to the people and successful in their use. For far too long the technologies of the Western World have been imposed on Africa and the developing world with often disastrous results. Too often engineers and technicians go to villages, with the best will in the world, to install facilities such as hand pumps, expecting the villagers to use them immediately and for long periods of time. If this does not happen, it is concluded that the villagers are ignorant and have no motivation to use clean, safe water. However, the truth of the matter is, that villagers have seldom been consulted on the subject of water needs and seldom prepared in the use and maintenance of facilities.

Conversely, it has been seen in many projects throughout the world, that with proper consultation and guidance from community leaders, people can be motivated to help in the construction, operation and maintenance of water facilities for their villages. The villagers, of course, require technical advice and assistance from the district or state government. Local craftsmen can be trained in the skills of construction and maintenance, and caretakers taught how to supervise new installations and educate the people in their proper use.

The problems of building, using and maintaining water and sanitation facilities are made much easier if the facility is properly designed in the first place to meet the needs of the people at all these levels. The technology or design of the facility should "fit the bill", should be simple, so that it can easily be built and maintained, and should be dependable with the optimum chance of a long life, and not the least popular and acceptable. Such technologies are known as appropriate technologies. They are designed with the user in mind, and are no imposed; they are designed so that local labour or skills can be used in their construction and maintenance, and in such a way that they can be accepted by the community.

Any technology in the Third World which is going to stand up to the test of time must be simple, cheap and totally dependable. Such features are not always easy to find. We can take a lesson from some of the elegant yet simple technologies of Ancient Islam, many of which have proved themselves over thousands of years. In Hama in Syria, waterwheels have raised water as totally dependable servants of/

of man for over a thousand years to irrigate the land and supply domestic water. In the desert regions the natural properties of the air have been used to full advantage to make living quarters comfortable in the hottest of climates. The use of natural energy has been used in the form of wind and moving water to grind meal or lift water for many centuries. The ancients knew that if they stored their water in deep underground cisterns, or passed it through sand or charcoal or stored it in copper vessels or even let it stand in the sun, the water became purified by natural means. The technology of these ancients was indeed so remarkable, that even iced sherbet was available in the Islamic markets over a thousand years ago. All this was possible because man had studied nature and had learned to live in harmony with nature - he made use of the very dependable forces used by nature. He was never in conflict with the natural world, but made nature his partner and not his slave.

The ancients had vision, which we have almost lost because we have entered the influence of the technological age, which often discounts nature. We have been made to learn or relearn from those who so successfully achieved in the past what we are trying to achieve now. To-day, we have the advantage of modern materials like cement, pipe and plastic which were unknown to these ancient peoples. What we must do is to build on well tried foundations and principles and from these evolve a technology suitable for the Third World.

Every country or province has its own particular needs and no one form of technology can be considered appropriate for every place. Geographic circumstances must be considered and the cultural needs of the people must be catered for. What works in the Sudan may not work in Malawi, and what works in Bangladesh may not work in Zimbabwe.

Because this is so, and the very clear need for new technologies associated with health to be developed here in Zimbabwe, the Ministry of Health decided some years ago to initiate a programme of Research into Rural Sanitation and Hygiene at the Blair Research Laboratory in Salisbury. The "appropriate technologies" which have been developed since that time are now on display at the Zimbabwe International Trade Fair - and focus on the need for "appropriate" sanitation and water pumping and purification facilities for the rural areas. Many systems are undergoing arduous trials, some are not perfected, others are in widespread use throughout the country. It is all a beginning ..... there is no end to it.

A DESCRIPTION OF THE EXHIBITED EXAMPLES OF "APPROPRIATE TECHNOLOGY".

A VENTILATED PIT PRIVY.

The deep pit latrine has distinct advantages in that it is cheap to build, easy to use and requires little maintenance, but it also has the disadvantage of acting as a perfect site for the transmission of flyborne disease. Some pit latrines are only one degree better than no sanitation at all, and under certain conditions may be worse! As a result, they are often replaced by more complex waterborne systems of sanitation which can often be equally undesirable.

Many attempts have been made to overcome the offensive odours and fly breeding commonly associated with pit latrines. 'Solutions' here include the use of coverplates, fly traps and chemicals, but all these methods are far from foolproof and cannot be regarded as successful. Ventilation pipes had been tried but with limited success until the system described here was put into widespread use in Zimbabwe in 1976 after two years of thorough testing. This Ventilated Privy provides almost complete protection against flies and odours emanating from the pit without the use of water, chemicals or coverplates. This makes it particularly useful where water is scarce or difficult to pipe to conventional waterborne sanitary devices, and it is safer and certainly more reliable than many waterborne methods of sanitation currently in use.

The system partly depends on the aerodynamic properties of an efficient fluepipe, 150mm in diameter and about 2,5m high. If this is fitted on to a concrete latrine slab over a sealed pit or tank the temperature difference between the inside and outside of the pipe will cause a convection updraught, drawing air and gases from the pit and thus causing a downdraught through the toilet aperture. Efficiency is increased by painting the pipe black and facing it towards the equator where it receives most sunlight. If there is a wind or noticeable air movement across the top of the pipe air is drawn through the system even at night or in cold weather. The top of the pipe is elevated above the roof level and kept away from trees to reduce air turbulence which causes a loss of efficiency. The upper end of the pipe is cone shaped and opens out to 200mm and is fitted with a fibreglass flyscreen.

When the latrine is in use, flies from outside are attracted to the odours passing up the pipe and tend to avoid the interior of the privy. Flybreeding is thus reduced in the pit. Flies emerging from the pit travel towards the greatest light source and are attracted up the pipe if the latrine structure is dark enough within. They are prevented from/

from escaping by the screen and eventually die. The pipe thus performs three functions: it draws out odours, prevents much of the fly breeding and traps most of the flies that might emerge. It is essential that the pipe is large enough to enable the system to breathe efficiently and that it allows sufficient light to enter the pit to attract flies. 100mm, 150mm and 200mm pipes were used in trials. The 100mm pipe was ineffective and the 150mm type was chosen because of its efficiency related to cost.

Basically the privy consists of a reinforced concrete slab placed over a deep pit lined with bricks or plaster. Two openings are made in the slab, one outside the superstructure for the pipe, the other within the structure for the squatting hole. The structure itself most be darkened inside and the most suffessful are cast in a spiral form without a door. The structure can be built from bricks but a popular method of building consists of plastering a corrugated iron mould with a plaster mix using chicken wire as reinforcing. It is essential that certain basic requirements described in the building instruction pamphlet are adhered to if efficiency and stability are to be maintained. Some imitations available in Zimbabwe do not meet these requirements.

Although the system works well without water, the privy can be built over a septic tank or seepage pit. This type of privy has been modified to produce biogas, and the pipe can also be designed to trap flies which have bred in other places. The ventilated privy works at its best when built as a single unit, with one pipe serving one squatting hole. Other combinations have been tried but are not as effective at reducing odours. An allowance is made for 3 cu.ft. (0,087 cu.m.) per person per year when estimating the capacity of the pit. Pits are dug round and plastered in situ for strength, usually about three to five metres deep.

The effectiveness of the unit has been tested thoroughly and one typical experiment serves as a good example: Four identical privies were built in a row, but only two were fitted with vent pipes. All the units were put into use for 6 months before the experiment. During the period October to December 1975, weekly counts of fly output were taken from one pair of structures (vented and unvented) whilst the other pair stabilised in use. The traps were moved from one pair of privies to the other at monthly intervals. During the period October 8 to December 24, 13 953 flies were trapped from the unvented structures, whilst only 146 were trapped from the vented structures. The structures differed only in the presence or absence of the ventilation pipe.

The ventilated Privy described above is very popular in Zimbabwe and many thousands are now in regular use all over the country. Its success and acceptability can be ascribed to its simplicity and reliability and the fact that it does not necessarily need water to operate. It employs the forces of nature alone to overcome the passage of disease.

A SIMPLE WATER PUMP.

Wells are known to offer a very attractive alternative to river water and where they are functional can play a very important part in preventing contact with infected waters. Wells are a very familiar feature in the rural areas of Zimbabwe, but unfortunately many of these are unprotected, and provide water of low quality. When wells are protected and fitted with standard hand pumps, water quality is often excellent and eagerly sought by the villager. The standard hand pump is designed to pump water from wells 50 ft. (15m) or more in depth, a feature which necessitates the use of levers and water tight washers. These two parts can wear out rapidly if conditions are unfavourable or if the facility is abused, and regular repair work may be essential. A surprisingly large number of wells are shallow, however, i.e. less than 20 ft. (6m) deep - and in cases such as those, experience has shown that neither the leather nor the lever are essential to pump water to the surface.

The simple hand pump on show has no lever or leather seal and has been on trial for several years. The pump uses standard water pipe fittings, PVC piping and two non-return valves. It is easily made and its construction now forms part of the Health Assistants Course at Domboshawa. A handyman or plumber could make it in any rural area.

DESIGN.

The pump consists of two parts, a moving piston/pushrod assembly and the fixed cylinder assembly. The piston section is made by cutting a 3" (75mm) length of 75mm class 16 PVC piping and inserting a standard ¾" (20mm) non-return valve (brass type) within this. The two are fixed together with a packing of trinepon putty. Two such piston sections are made. The pushrod/spout consists of a length of ¾" (20mm) galvanised piping, cut to the same length as the cylinder. This is threaded at both ends, the lower end being attached to the piston. The upper end is attached to a 1" to ¾" (25mm to 20mm) reducing socket which is in turn attached to the pump head which is made from 1" (25mm) galvanised pipe fittings (two barrel nipples, one T and one bend). The cylinder is made by cutting a suitable length of 90mm class 16 PVC piping (into which the 75mm piping should fit). The second piston section is attached to the lower end of the cylinder either by bolting or preferably as a press fit. This press fit is achieved by attaching to the lower end of the cylinder a cut half of a 75mm PVC connector cemented within a cut half of a 90mm connector (also PVC). This cemented combination is in turn cemented to the bottom of the cylinder. The lower piston can then be inserted through the cylinder to form a press fit at the base. The upper end of the cylinder can either be cast within a concrete base which rests on top of the well cover or preferably fixed to a 90mm PVC pipe to thread connector.

This/

This PVC connector is then threaded to a standard 3" (75mm) socket and the connector and socket are then cast within a concrete base. The guide for the pushrod consists of a standard 3" to 1" (75mm to 25mm) reducing bush which is threaded into the 3" (75mm) galvanised socket now cast into the concrete base. An alternative guide can be made by cutting a ¼" (6mm) steel plate with a central hole for the ¾" (20mm) pushrod which is bolted to the concrete base. Finally, a 1" (25mm) hole is drilled 1 metre from the base of the cylinder, through the cylinder wall to allow water that rises above the piston within the cylinder to drain back into the well.

OPERATION.

The two parts of the pump are fitted together and lowered into the well so that the working parts are below water level. When the pushrod is forced down the lower valve closes forcing water through the upper valve and up through the hollow pushrod to the surface. The force used to pump the water is directed down the line of the pump and not across it and these forces are buffered by the water itself. Because the piston is not a tight fit a small amount of water passes by at the cylinder wall - this water lubricates the moving parts while they are in motion. PVC has a low coefficient of friction and the wear is minimal. The pump head is seated low down so that once a bucket is inserted beneath the outlet the pushrod comes to rest before the end of the full stroke. This simple part of the design avoids the end knock which could eventually break up the concrete base. All the valves can be removed and replaced if necessary from the surface. Only a small part of the pump is situated above ground level which minimises abuse. The longest pump in operation is 27 ft. (8 m) long, but it is recommended that 20 ft. (6m) is a normal maximum. The limiting factor is the weight of ¾" (20mm) pipe that a child can lift.

The pump delivers an appreciable volume of water, the exact amount depending on the length of the stroke and the rapidity with which the stroke is made. An important feature of all hand pumps is that water wastage is minimal, a factor of importance where water may be scarce.

THE WATERWHEEL-SPIRAL TUBE WATER PUMP.

The great Roman waterwheels in Syria have raised water for Man for over a thousand years. They serve as superb examples of a technology so elegantly simple that it becomes totally dependable. These great wheels and many thousands like them raise water on the rim to spill into troughs just below the full height of the wheel. The diameter of the wheel must, therefore, be equal to or more than the desired pumping head, and for this reason many have been built to huge proportions. Attempts to use the power of the wheel to raise water above the level of the rim have often involved the use of chains, valves, pistons and levers, all of which totally destroy not only the simple elegance of the wheel, but also its dependability.

Last year, a simple waterwheel operated water pump was developed in Salisbury which raises water well above the level of the rim. The pump is a perfect match for the wheel for it is simple and dependable and consists of little more than a tube open at both ends. Surprisingly, searches through the relevant literature have so far failed to reveal a similar arrangement.

The tube is so arranged that it forms a spiral fixed on the side of the wheel in one plane. The outer extremity of the tube collects water as it dips into the water driving the paddles of the wheel, and this core of water passes through the spiral followed by a core of air. A new core of water is formed on every revolution. The innermost spiral of the tube delivers water to the axle of the wheel and there it is led off through a simple waterseal to a static rising waterpipe.

As the wheel revolves, a pressure head develops within each coil of the spiral tube, water in the rising coils being higher than in the falling coils. The cores of water in the spiral compress air between them as they travel round the tube and both water and air are expelled under pressure at the central point. The height to which water can be pumped appears to depend on the number of spirals in the tube. A 2m diameter wheel can pump up to at least 8m with 6 complete coils, the same wheel being able to pump up to 6m with 4 complete coils and 4m with 2 complete coils. The volume pumped depends on the amount of water picked up during each revolution and on the capacity of the spiral tube. Several spiral tubes can be fitted to the same wheel. The flow of water up the static rising pipe is also accelerated by the air escaping and expanding from the outlet at the axle of the wheel. With a single spiral, air and water are expelled alternately at the outlet, the pressure head in each coil developing to their maximum as the water pressure head in the rising main is at its highest. With two spirals, air and water rise through the pipe in more regular bursts.

Considerable/

Considerable pumping heads could be achieved if necessary by using an appropriate number of coils on a wheel of appropriate size in a canal or river system charged with adequate water power. The power delivered to the paddles must overcome the weight of water held in the rising segments of the spiral, and obviously this is a limiting factor. When the number of coils in the spiral is not sufficient to pump water to the desired head, water flows over from one coil to the next in the spiral and there is a loss of efficiency.

The great advantage of the system is its extreme simplicity and reliability. The pump makes a perfect partner for the wheel and both harmonise with the natural system. Hopefully, arrangements like this spiral tube pump could revive the status of the waterwheel in a world sadly lacking in cheap energy.

A small 2m wheel on trial near Mazoe delivers 7 000 litres of water a day from a small canal to a header tank by the side of the canal. Over Z$1,00 worth of petrol would be needed every day to pump the same quantity of water to the same tank. In the course of a year, the simple pump pays for itself six times over in terms of a saving in fuel. This indicates the very considerable saving of money and fuel even on this very small scale. The pump is ideally suited for pumping water in irrigation schemes, where it can be fitted in canals. It can also be used where ever there is falling water as the demonstrations show.

THE "SWING PUMP".

All children enjoy playing on swings, seesaws, roundabouts and other play devices and a considerable quantity of energy is used every day in keeping these devices in motion! Why not use this energy for some useful purpose?

The "Swing Pump" is an example of "child energised appropriate technology". It makes use of the forces applied to the device and yet at the same time does not distract from the sheer joy children get out of swinging to and fro. In this particular case the forces applied through the swings are used to activate a standard reciprocating borehole/well pump and thus raise water to the surface. Clearly the most ideal setting for such a pump is the rural school - at playtime.

Once again, the design of the pump is very simple. It is made from gum poles water pipes, nuts and bolts, large eye bolts, chain and, of course, the water pump itself.

CONSTRUCTION.

Several gum poles, five or six inches (127mm or 152mm) in diameter and preferably treated against insects and decay, are obtained, and the cross section pieces are bolted together as illustrated. The horizontal member is also bolted on to these end sections. The main beam on to which the swing pipes and chains are attached is cut about 2m long. Holes are drilled in this beam to take the 1¼" (32mm) water pipes which are used for the swing itself, the large 1" (25mm) eye bolts to suspend the beam, and a bolt on to which the chain is attached. Holes are also drilled into the horizontal members of the end sections to take the eye bolts from which the main beam is suspended. The swing is positioned so that the chain hangs down directly over the line of the pump installed in the well. The gum pole end sections are concreted into holes dug in the ground. A metal collar can be fitted around the beam to reduce the wear of the chain.

The Water Pump.

This consists of a standard reciprocating 2½" or 3" (62mm or 75mm) borehole pump with a stroke of up to 12" (30cm). Normally rods are used to activate the piston within the pump, but in this case the power stroke occurs only i one direction (upwards). Since there is a chain linkage, and no downward force can be applied to the piston through a solid rod linkage, the piston must be weighted so that it falls. In fact, the normal rods are retained, or if the pump is only 3 or 4m long, larger diameter rods are attached to the piston so that the piston and rod fall under their own weight. In some cases it is necessary to file off some of the leather on the seal of the piston to reduce friction and so obtain a free movement. The head of the pump is made from 40 or 50mm pipe fittings with a guide for the rod made from a 50 mm to 25 mm reducing socket (see illustration). The chain can/ .

can be linked to the rod with a D shackle, but since the swing may be put into use when no water is required, an alternative connection may be desirable. In this case, the D shackle fitted to the rod is attached to a hook, and the chain is also attached to a hook. When water is required, the two hooks are fitted together, but when no water is required, they are merely disconnected.

OPERATION.

When a child is swinging on the pump, a stroke of up to 150mm can be expected, and more if the child is energetic. The actual lifting capacity of the device is very considerable. If a large man hangs on the chain, a small child can raise and lower him by swinging on the device. Obviously, a little grease applied to the eye bolts helps to lubricate the system, and the maintenance to the water pump is no different from normal.

Any swing has a magnetic effect on any child and perhaps this is why the swing pumps on trial are very popular.

THE FAMILY SAND FILTER.

Sand has been used to purify water by Man for over a thousand years. Water that is taken from a sandy river bed is generally pure, because it has perculated through the sand grains where the bacteria harmful to man die out. The process is one that occurs in nature and, therefore, if the conditions are right, is very dependable.

Work is being carried out on large sand filters by the Ministry of Health, and this is still underway. Small family size sand filters are also of great interest and of value in the rural areas and these are being studied in detail as well.

BASIC DESIGN.

200 litre drums are the most common containers used to build family size sand filtration units. It is possible to purify 160 litres of water a day in such a unit, which is ample drinking and cooking water for a family. The degree of purification is considerable and in excess of 95%. Sand-filters of this type should be well maintained and cleaned regularly.

The drum is cleaned well and, if possible, painted with a protective covering such as bitumastic paint. The water collector (underdrain system) and outlet pipe are best made of PVC piping. The underdrain system is made in the form of a cross with hacksaw cuts made in it from the lower side to allow water to pass through it. 50mm diameter piping is ideal for this. The ends of the piping are sealed off with plastic or trinepon putty. The outlet pipe can be smaller and those in use are 8mm in diameter. The pipes are fitted together and led through the walls of the drum with trinepon putty. The outlet pipe comes out horizontally just below the level of the sand layer (see illustration). Ideally, the sand filter should be left running continuously, the incoming water being led from some form of storage tank through a ball valve into the filter.

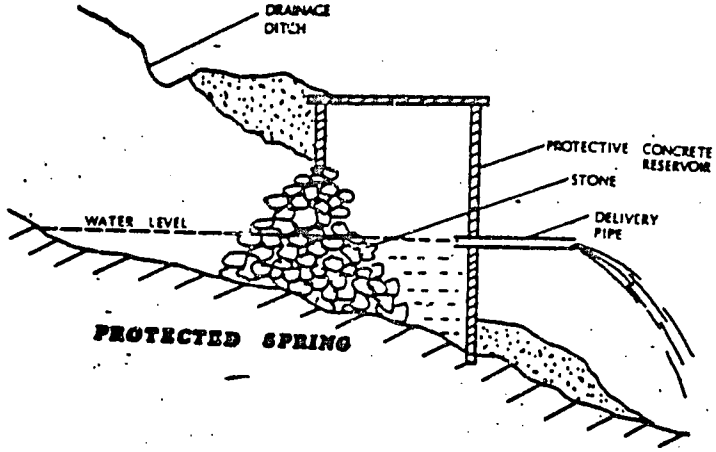
After the underdrain and outlet pipes have been fitted, a layer of washed gravel or ¼" chips about 75mm deep is placed at the base of the drum. This is covered with a layer of washed river sand about 700mm deep. The inlet ball valve is adjusted to allow approximately 50mm of water to lie on top of the sand. The flow of the water can be regulated by adjusting the ball valve. At no time should the surface of the sand layer become dry. With a good running speed enough water should be delivered from the outlet to fill a 5 litre tin in about 40 minutes. The filter should be covered and the water delivered from the outlet should be led to a covered storage vessel.

The/

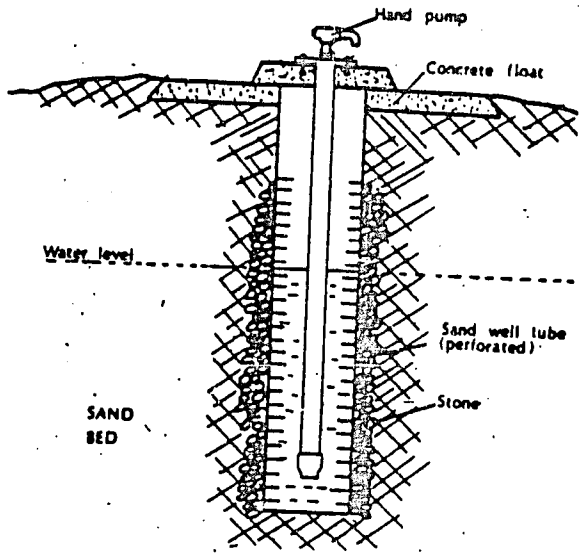
The filter should be cleaned when the flow becomes too small, normally after a few months. To clean the filter, drain out the water and scrape off a very thin layer, about 10mm thick, from the sand surface and throw it away. Then lightly rake the sand surface to leave it loose. After several such cleanings, the sand bed must be topped up to its original level with clean sand.

FOR FURTHER INFORMATION.

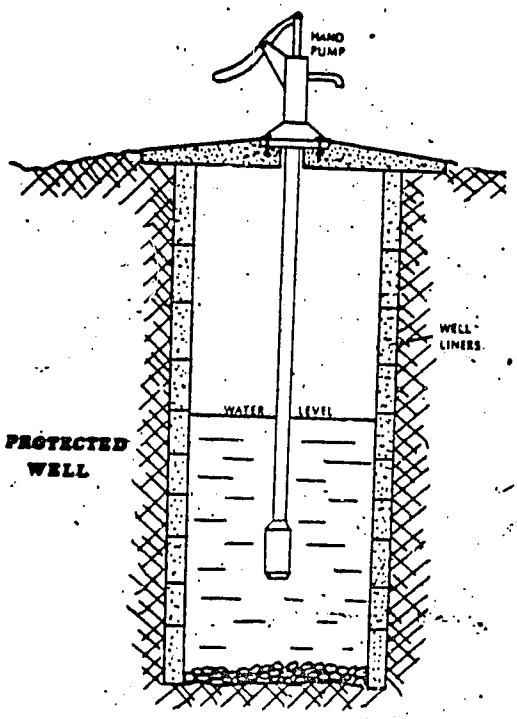
Many other forms of technology are available for the prevention of disease transmission in rural areas. This range of technology includes water-pumping windmills, several types of hand pump, washing slabs, drinking fountains, water points and sewage disposal systems. The best people to consult on such matters are the Provincial Medical Officers of Health and their staff in Salisbury, Bulawayo, Umtali, Fort Victoria and Gwelo, or The Blair Research Laboratory in Salisbury.



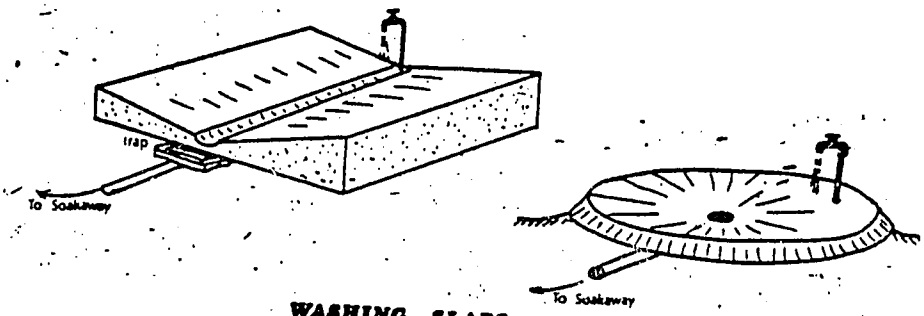
PROTECTED SPRING



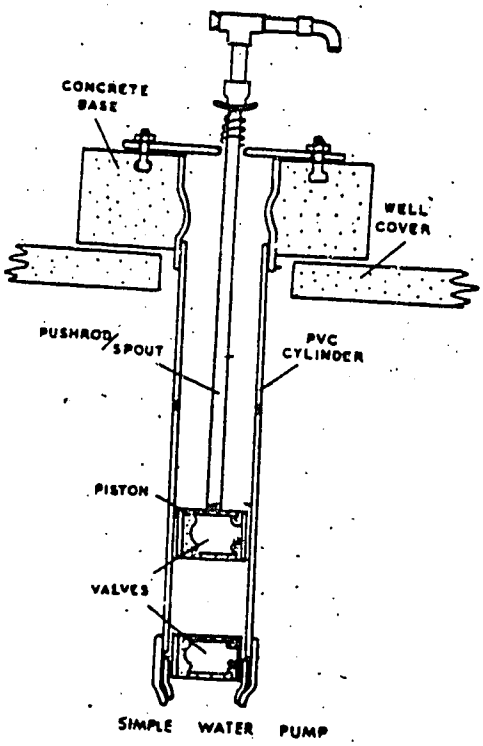
SIMPLE SAND ABSTRACTION



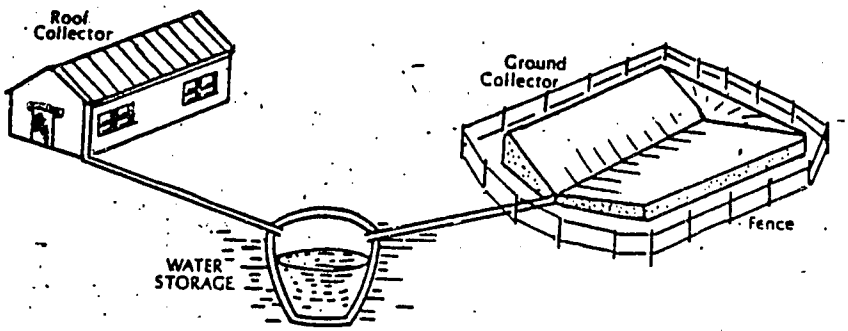
PROTECTED WELL



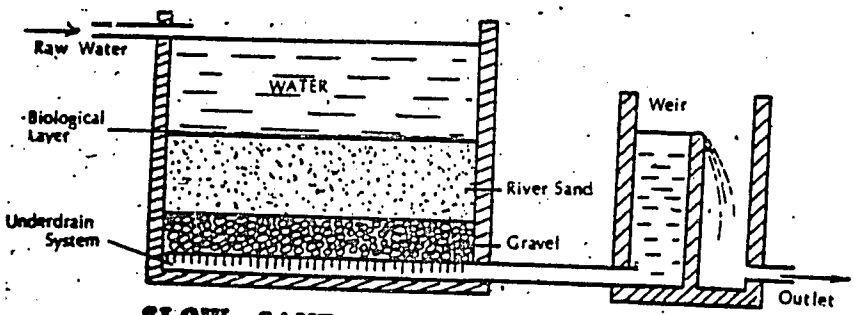
WASHING SLABS



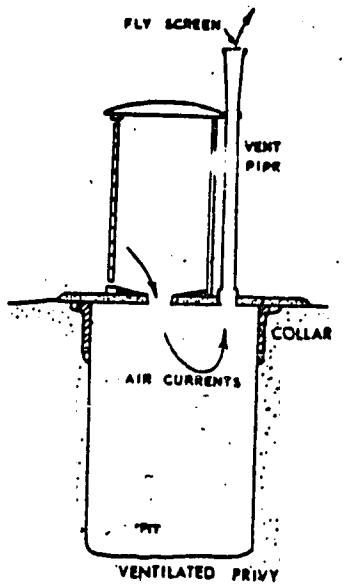
SIMPLE WATER PUMP



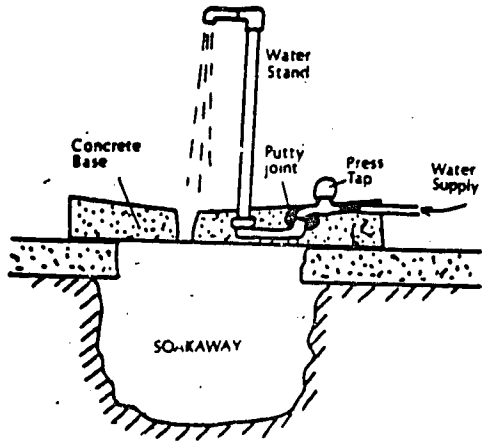
WATER HARVESTERS



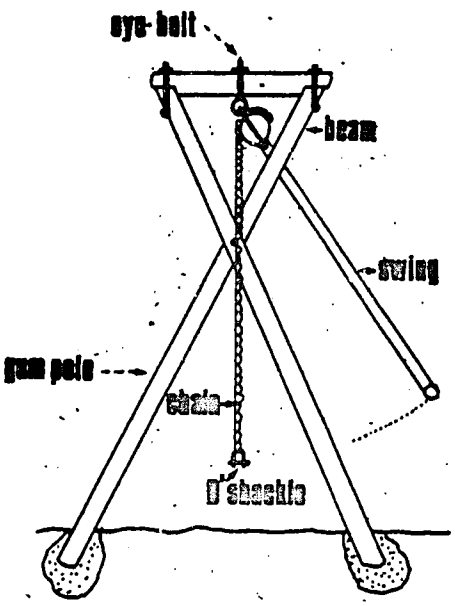
SLOW SAND FILTER



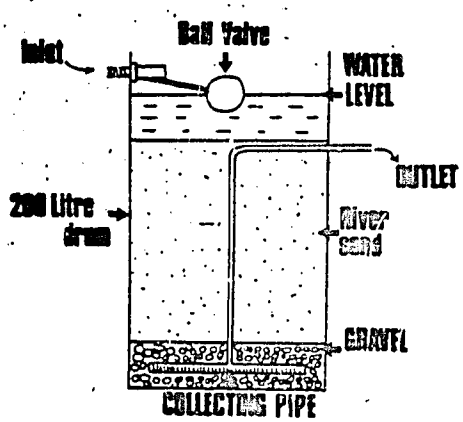
VENTILATED PRIVY



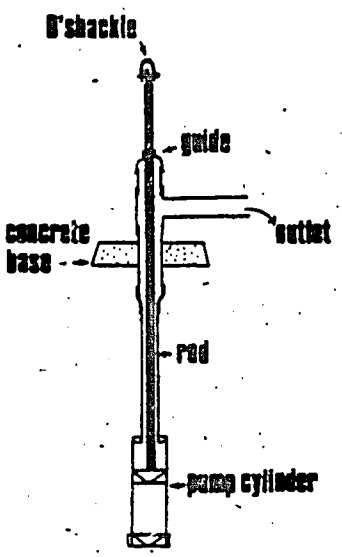
HAND WASHING STAND



SWING PUMP (upper section).



SMALL SAND FILTER



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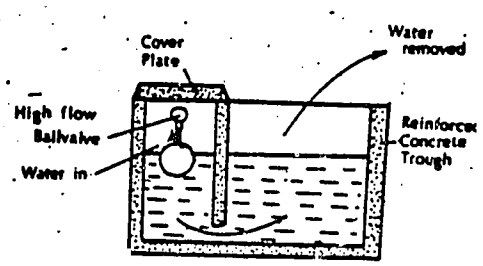

TAPLESS WATER POINT

RURAL HEALTH SERVICES

INTRODUCTION

Most of the 7 million people in Zimbabwe live in rural areas - in villages and small townships, and on mines, small industries or farms.

Although it is difficult to provide adequate health cover to small communities scattered over huge areas, this is a top priority in Zimbabwe. Methods of improving family health by using better sanitation, safer water and better water pumps are on show at the Ministry of Health Trade Fair stand. These will help to provide a safer environment in rural communities.

Personal health care services are provided by many kinds of health workers who live and work in the rural communities whom they serve. The front-line health workers are described below and each plays a very valuable role in improving health standards in rural Zimbabwe. Some work in Mission hospitals, Local Authority or Industrial Clinics, but their work is co-ordinated and guided by the Ministry of Health. If they are going to be well-motivated and efficient, their training and constant supervision is very important. This is carried out by doctors, health inspectors and nursing sisters in the Provincial Health Departments and Hospitals whose supervision and in-service training courses ensure a high standard of primary health care in rural areas where such staff and facilities exist. Expanded training and building programmes will enable primary health care facilities to be within everyone's reach - a top priority for the Zimbabwe Ministry of Health.

MEDICAL ASSISTANT

Rural Hospitals and Clinics are staffed by Medical Assistants normally trained in Mission Hospitals, following a syllabus laid down by the Medical Council. They can diagnose, treat and nurse the majority of diseases seen in rural areas, as well as injuries and problems of pregnancy. They provide primary health care facilities in many remote parts of rural Zimbabwe, and most of the sick people in this country are treated by Medical Assistants initially. Difficult cases are referred to the nearest District Hospital for investigation and professional treatment. The Clinics may be run by the Ministry of Health, Provincial Authority or Missions, but the quality of care provided depends on the well-trained and motivated Medical Assistant who is backed up by medical and nursing staff.

HEALTH ASSISTANT

Trained in environmental health, they help people understand the value of safe water supplies, sanitation and hygiene in the home and community. They help to provide these facilities and give advice about many health problems. They keep contact with families of T.B., leprosy and mental patients, ensuring adequate after-care. They assist in disease-control programmes, especially malaria, bilharzia and gastro-intestinal diseases. They inspect and improve health facilities in schools, townships and business centres.

They are trained at Domboshawa and in Provincial Health Departments and live in the rural community which they serve, under the supervision of senior Health Assistants and Health Inspectors of the Provincial Health Departments.

HEALTH ORDERLY

Mobile field teams of Health Orderlies, supervised by Field Officers and Field Supervisors, are available to deal with almost any community disease problem. They carry out anti-malaria spraying programmes, bilharzia control and better sanitation projects. They travel in four-wheel drive vehicles to wherever they are needed, and are self-sufficient, being able to camp on the spot until the task is completed. They carried out the mass vaccination campaigns which helped to eradicate smallpox in Zimbabwe, and are used in plague and cholera control.

VILLAGE HEALTH WORKERS

Intelligent and respected women are chosen by the community and trained for six months in all aspects of mother and child health, family planning, first aid, home nursing and hygiene. They work part time, in their own communities under the guidance of Community Health Nursing Sisters of the Provincial Health Department. They link the community and the Ministry of Health, providing basic preventive and curative health care at village level, and calling in other health workers when necessary. (In China they are called bare-foot doctors .....)

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