

A FRIENDLY MICROBE

AND THE MARVELLOUS SERVICE HE RENDERS TO MAN.



WE live in a world of wonders, and the inquiring mind, even without the aid of a scientific training, will find endless subjects to interest it; but he who is able to peer through a microscope will open up an entirely new world which is even more wonderful than that seen with the naked eye.

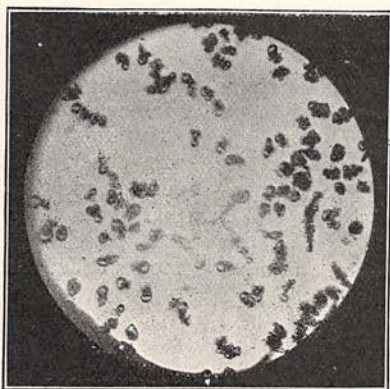
To the layman, "microbe" has an ugly sound, and at once suggests disease and death; but the microbe I am going to write about does everything in his small way to drive off disease and prolong the span of human existence. This microbe is a very little chap indeed; some idea of his size may be gathered when it is stated that a square inch of space is ample to accommodate four hundred millions. Therefore a postage

stamp would afford room for a family of our friendly microbe exceeding in number the population of the whole of China. That, no doubt, seems a startling statement; but the wonder increases by the fact that each one of the vast multitude on the postage stamp is endowed with a perfect organism, and lives, works, quarrels, and dies exactly the same as the creatures of a higher sphere. Nor is this all; in order to increase and multiply his species, he can divide himself, on an average, every half hour,

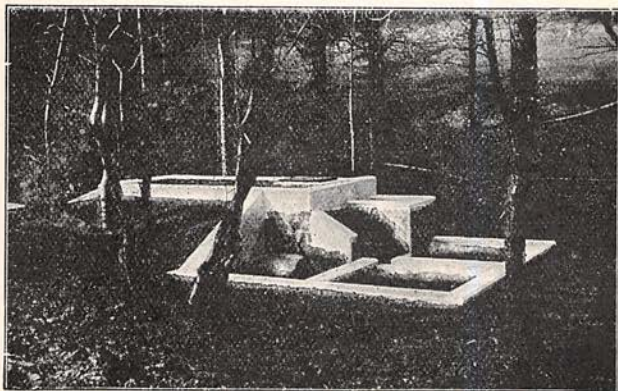
and it has been computed that one microbe can, in the course of a day and a night, become the founder of a family numbering sixteen millions, or thereabouts. Those who are mathematically inclined, can work the sum out on this basis, and they will find that in the course of three or four days the figures run into billions, and the weight of the family would have to be estimated by tons.

Now it needs no great stretch of imagination to realise that, unless there were some check to the rapidity of increase on the part of friendly microbes, and those that are not friendly, human life would become impossible.

It is pleasant to state that in the microbic world man has very many friends. Bacteriologists tell us that there are thousands of species; but so far only about



ANAEROBIC COLONIES CULTIVATED FROM SLUDGE CAKE ON SURFACE OF SEPTIC TANK, VERY HIGHLY MAGNIFIED.



SEPTIC TANK INSTALLATION AT A PRIVATE MANSION.

forty are known to be foes to human life. Were it otherwise man would cease to exist. True, death is the common end of every living thing, but the span of life may be greatly increased by baffling and overcoming disease. We have discovered that health and long life are incompatible with insanitary conditions, and sanitation has become a watchword. Wherever there are aggregations of human beings, the dangers to life are increased manifold, and it is here that our friendly microbe has been pressed into our service, and allotted a task which he performs in the most perfect manner, as I will now proceed to explain.

It is perhaps hardly necessary to say that one of the most difficult problems our City fathers have to face is the disposal of the waste matter of towns. The pollution of

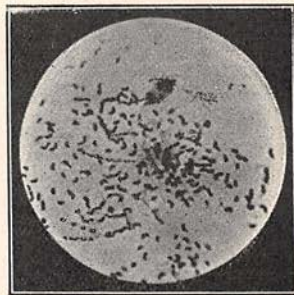
never known before; but they have only succeeded in poisoning the land until this land has sickened, and, so to speak, died. Chemistry has tried its hand on the waste products, and has had a partial success,

for it has purified the sewage, but has been unable to get rid of the *solid* residue, which is known to engineers as "sludge." A town like Manchester, for instance, has over 500 tons of sludge a day; and London, with its 200,000,000 gallons of sewage per day, yields such a tremendous amount of sludge that a large fleet of barges has been necessary to remove it to the Nore, and there dump it into the sea, until it has become a source of danger to shipping owing to its forming banks in the channels of navigation.

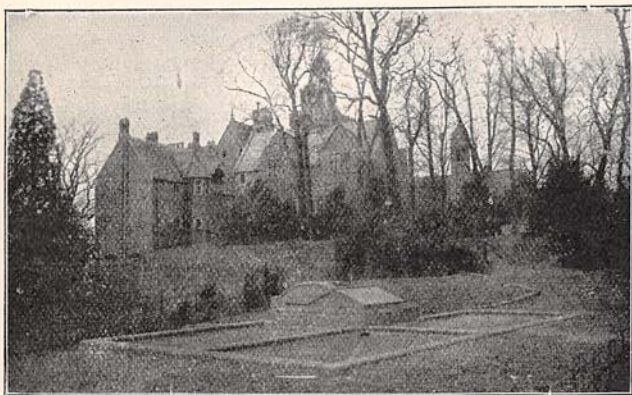
A German who had long puzzled over the problem of how to get rid of sludge, suddenly exclaimed "Eureka," until his family thought he had gone mad. However, he adjusted his spectacles, donned

his best clothes, and hurried over to perfidious Albion with a scheme that was to turn London into a paradise. It was nothing more nor less than the conversion of the sludge into coal. For a moment or two things looked bad for the bloated colliery proprietor and the grimy, hard-working pitman. There was to be a mighty slump in collieries. But the worthy Teuton's scheme didn't pan out, and he went back to the Fatherland a sadder and a wiser man.

Then up rose another daring spirit and said, "Let us set the merry little microbe to work, he'll do the trick." The daring spirit was howled at and ridiculed; but he knew what he was talking about, and he wasn't going to be put down. He and his colleagues shut themselves in their laboratories, and had long and earnest interviews with the microbe family. They set them on the task, and watched them night and day, with the result



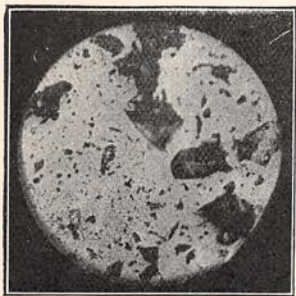
CULTURE PREPARED FROM A SLIGHT SCUM COLLECTED FROM SURFACE OF FILTER.



A SEPTIC TANK INSTALLATION AT A PUBLIC SCHOOL.

rivers, the contamination of the air, and the destruction of all organic substances calculated to prove breeding grounds for deadly germs, are questions that have long agitated the minds of our legislators, and taxed science itself. Utopian schemes have been devised

by well-meaning people for the conversion of garbage into garden or orchard produce; but they have ended in disappointment. "Sewagefarms" were to work give us crops such as the world had



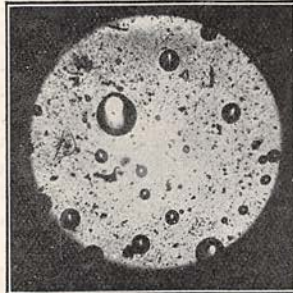
EFFLUENT CULTIVATION TAKEN FROM GAUGE WELL BEFORE PASSING OVER AERATOR.

that to-day these microbes are labouring by billions in various parts of the country, and silently but surely miraculously transforming town refuse into pure water, clear as crystal; and into gas that can be used for street lighting or engine driving. Now doesn't this read like a fairy story? Well, so it is—one of the fairy stories of science; but, unlike most fairy stories that are the gossamer weavings of dreamy brains, the fairy stories of science are true.

The way this microbe business came about was owing to an important discovery of M. Louis Pasteur, the French biologist, who found that there was life without air. He demonstrated conclusively that certain microbia which were

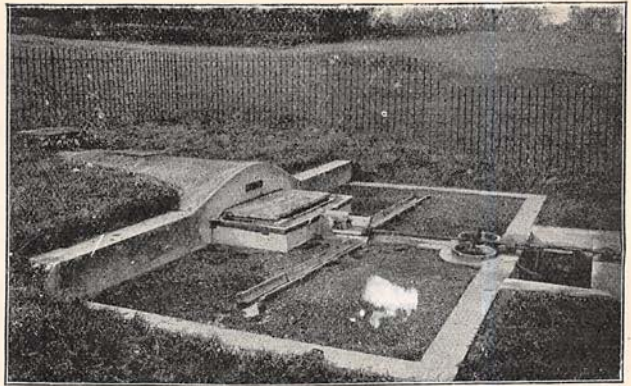


PLATE CULTURE INCULCATED WITH MATTER IN BODY OF COKE BREEZE FILTER AFTER BEING RESTED FOR FOUR DAYS.



CULTIVATION FROM FLUID IN SEPTIC TANK AS NEAR CENTRE AS POSSIBLE.

capable of setting up fermentation and destroying complex organic structures, could not draw their necessary oxygen from the atmosphere, but procured it from a substance containing that element. Whatever the substance was, whether animal or vegetable, the structure collapsed when the microbe had taken the oxygen away, and the atoms of which it was composed arranged themselves into "new groupings," to use a scientific term, thereby forming harmless, inoffensive, and even useful substances. The difference between a repellent product of digestion or disease, and an article that may be a necessary food substance, is one of *structure* only. That is to say, the atoms in each are arranged differently. The same

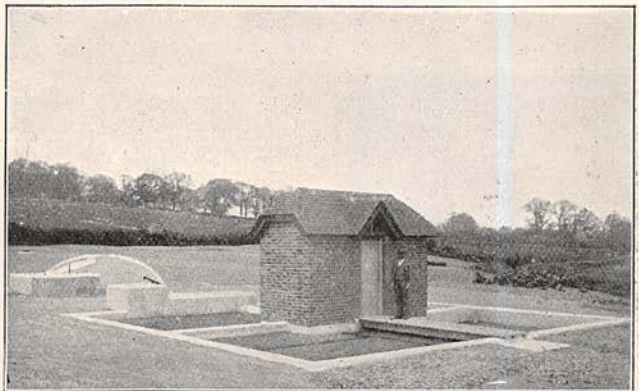


SEPTIC TANK AT A MANSION, WHICH HAS BEEN AT WORK OVER SIX YEARS.

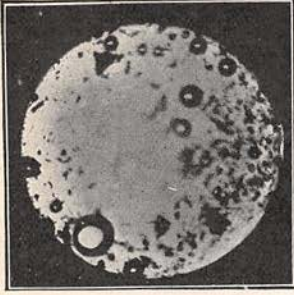
elements that produce a delicious fruit may be rearranged so as to give us a deadly poison. For instance, a loaf of bread has for its principal constituent elements, carbon,

hydrogen, and nitrogen; but these three elements may be so grouped as to form prussic acid, one of the most deadly of poisons. There are only about seventy known elementary substances in the world; and the greater portion of this planet—including animals and vegetables—is made up of about a dozen elements. Matter, of course, cannot be destroyed. It can only be changed. A liquid can become a solid, a solid a liquid. Or a solid and a liquid can be converted into a gas. Now, were

it not for our merry friend the microbe the earth would soon become covered with the dead bodies of plants and animals, and our planet would not support life as we under-



SEPTIC TANK INSTALLATION FOR AN ESTATE.



SHOWING 10 DAYS' INCUBATION AT 70 FEET OF MUD AT BOTTOM OF SEPTIC TANK.

is air and light tight is necessary. A knowledge of this remarkable fact led to the construction of what is now known as the *septic tank*, as a workshop for the microbes, by Mr. Donald Cameron, the City Engineer of Exeter.

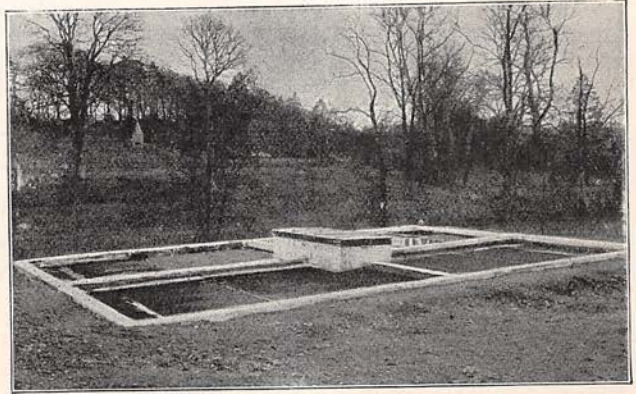
The septic tank is a pit, lined with brick on concrete; it varies in length and breadth according to the size of the town. The tank is completely covered with a concrete arch, over which is a mound of earth where grass or flowers may be grown. As soon as the workshop is ready, the anaerobic microbe, which is found in sewage, is introduced to his new quarters. As the tank is arranged to secure all the conditions the most fastidious microbe could possibly desire, he immediately increases his species by myriads of billions. Necessarily, like all living things—whether animals or plants—the microbe must have oxygen, so in goes the crude sewage of the town or village, and then the colony of labourers commence operations, and quickly carry out their allotted task. The complex organic structures of the waste matter are attacked by the anaerobic navies and broken down, and as soon as the atoms, of which these structures are composed, are

stand it. The tiny little fellows who render us such important service are known as *Anaerobic Bacteria* (anaerobic means life without air). There are several species of them, and to breed them a receptacle that

set free, they rearrange themselves in new groupings, and become harmless and useful products. This application of Pasteur's discovery ranks as one of the most astounding marvels of the age.

Following out the strange processes that take place in the septic tank, we find that the solids are speedily reduced to liquids and gases. The liquid in the tank after the labouring microbes have completed their work, has the appearance of soapy water, almost odourless, and with the gas it represents all that remains of the sewage.

Now comes a second phase of the transformation. The complete purification of the effluent is taken in hand by another gang of friendly microbes, and the so-called filters are receptacles prepared for their breeding. These little scavengers require both light and



SEPTIC TANK INSTALLATION, DOUNE, N.B.

air. They take their oxygen from the atmosphere, and if the open filters are properly aerated, and perfectly constructed, the *Aerobic Bacteria* perform the second half of the purification so successfully, that in about twenty-four hours after the crude sewage enters the septic tank, the filtered effluent, like a crystal stream, flows from the filters into a river to purify it, or on to the land to irrigate it, and increase its fertility.

Can any fairy tale surpass in wonder this story of the work of some of Nature's scavengers? It is hard to realise that the crude sewage of a town, however large, can be disposed of rapidly and effectually by minute organisms that are only visible to the eye by means of the most powerful of microscopes, when they appear like tiny morsels of very thin string. In setting our friends to work, we ensure a healthier land, a happier people, and a longer span of human life.



CULTIVATION FROM BODY (CENTRE) OF COKE BREEZE FILTER.