

ized country three hundred and fifty thousand cases of typhoid occur every year with a death penalty of 10 per cent.?"

Let me cite you an instance to illustrate to you the possibilities of water pollution through underground veins or crevices and its lamentable results. The case is an old one to sanitarians, but new, no doubt, to some. A small village in Switzerland; near Basle, is supplied with water from a spring situated at the foot of a mountainous ridge. An epidemic of typhoid fever broke out, which struck down over 17 per cent. of the panic-stricken inhabitants of the village. The fever was pretty well distributed through the village, but a group of six families had entirely escaped the scourge. Suspicions were aroused regarding the purity of the waters of this spring, and an investigation was made.

On the other side of the ridge before alluded to was a little valley, which when irrigated, always increased the flow of the spring on the other side of the mountain. It was found that a peasant, living in the valley, had returned from a distant city, sick with a fever, and that the water in a little brook in which his clothes had been washed and into which the slops of the house had been cast had been used to irrigate the meadows. Of course, the polluted water filtered through the surface of the soil and joined the underground water, to go—no one knew where.

In order to determine if it could be possible this spring was fed by the underground waters of the valley over a mile away, experiments were made. A large quantity of salt was thrown into a hole dug in the valley to a water-bearing vein of sand and gravel. In a few hours the waters of the spring became very salty.

They now mixed two and one-half tons of flour with water and poured this mixture into the hole, but after much waiting and close examination not a trace of the flour could be found in the water in the spring.

This proved conclusively that, though the water-bearing vein through which this water had to pass carried salt in solution to the spring, at the same time the granular constitution of the vein was sufficiently fine to prevent the finest particles of flour reaching it.

It should, then, be quite clear to the reader that the passage of water through underground veins is no assurance of its purity, and neither is clearness any proof of purity—for, says Mason: "It is a fatal error to fancy that because a water has a bright, sparkling, clear appearance and a pleasant taste, that therefore such water is wholesome. Carbonic acid gas is what causes brilliancy and refreshing taste of a ground water. When it is borne in mind that carbonic acid is one of the products of sewage decomposition, the inference as to its possible source is not a pleasant one." Neither is turbid water to be adjudged as dangerous merely because it is turbid. While visiting, a few years ago, the city of Defiance, Ohio, which then derived its water supply from the Auglaize river, and on drawing a glass of water from a faucet in the hotel, I was obliged to wait until the heavier suspended particles could settle to the bottom of the glass before it was sufficiently wholesome to drink. The water was roilly and unsightly as well as unwholesome, but was not regarded as unsafe at that season of the year, when the Auglaize river was nearly overflowing her banks in consequence of the prevailing rains.

I recently asked a wealthy manufacturer how he disposed of the sewage of his summer home at one of the lakes in Northern Michigan. "Oh," said he, "I dig a cesspool down to the gravel, and then the stuff runs away." "Where is your well?" said I. "About one hundred feet away," was the answer, and then he proceeded to explain to me, in an assuring way, that the bowel discharges and sink wastes that

went into his cesspool would be entirely purified by passing through the strata of fine gravel before reaching the well. Now, this man I know to be a gentleman of splendid intelligence, the mayor of a city and a leading light in his community, but, in spite of his intelligence, he was totally ignorant of what the essential processes are that produce sewage purification. He evidently had in mind that the substrata of gravel would filter the cesspool seepage to purity. He did not know that purification of such foul liquid is impossible without fresh air and the action of aerobes. And here lies the danger: that the common people, and even the most intelligent people, are led astray sometimes through lines of their own incorrect reasoning, and sometimes through erroneous information imparted by pretenders that know nothing of the principles of decay, but try to make folks think they do.

The opportunity for the contamination of well water, particularly in towns and villages or in the suburbs of towns and cities where sewerage is absent, is often very great. It is no uncommon practice for the owner of a small lot to construct his well and a cesspool within a few feet of each other. The contents of this filth hole soak away and mingle with the ground waters, only to reach the well; for even the most ordinary mind can see that as water is drawn from a well the well is replenished by just so much of the ground water surrounding it, and if this ground water is polluted, health and life of your family or neighbors are jeopardized.

The question then might arise as to the advisability of using a cesspool where city water mains were available, but we answer that if we live up to the standard of righteousness and of model citizenship, then it would be an example of the grossest selfishness on one's part not to have an interest in the welfare and health of one's neighbors who might yet be using wells, for through such selfish indifference to the health and welfare of the neighbourhood we might be rightfully regarded as undesirable citizens.

Mason also says that "It is hopeless to depend upon the purifying influence of the intervening soil to protect the wells from privy and cesspool fouling, because soil filtration, in order to be effective, must be intermittent." With a constant flow of pollution on or through any soils, the purifying powers of the soil quickly cease to act. Intermittent flow is absolutely essential to admit air to the aerobic bacteria where present, if purification is to be effected.

E. Bailey-Denton, in one of his courses of lectures delivered to the students of the Royal Agricultural College, England, said of the cesspool as a method of sewage disposal: "It is a system of disposal which I do not recommend, and which should always be avoided if possible, and no matter if built under circumstances most favorable, will remain liable to all the objections to which cesspools are admittedly subject."

Rideal, the well-known English authority on sanitation, has pretty well described the results of harboring a cesspool. He says, and it is reasonable to believe, that "the soil about cesspools becomes water-logged with black fœtid matter which undergoes little or no oxidation." I here wish to add that without oxidation of the seepage of cesspools, say nothing of the liquids of the septic tank, purification of sewage is not accomplished.

Dr. Bashore, former inspector for the Pennsylvania State Board of Health, in his little work on the "Sanitation of a Country House," says of the cesspool: "It is a relic of medieval shiftlessness and carelessness for which no excuse can be offered."

Prof. Merriman, in his "Elements of Sanitary Engineering," says: "The privy or cesspool is walled up with loose