"The absence of sulphureted hydrogen in samples of unfiltered effluents which have been kept in stoppered bottles for three weeks is also a fact of importance.

"The settled sewage was not in this condition, as it rapidly underwent decomposition in two or three days, even when in contact with air.

"By this process the soluble organic matter is reduced to a condition favorable to the further purification by natural agencies."

SIR HENRY ROSCOE'S ANALYSES.

Percentage Reductions.		
No.	Oxygen Required to Oxidize.	Albumenoid Ammonia.
1.....	67.4	57.0
2.....	64.3	57.3
3.....	77.2	75.0
4.....	72.6	50.0
5.....	76.5	87.5
6.....	73.0	87.5

Another series of experiments carried out by Sir H. Roscoe, which I have tabulated, show an average reduction of sixty per cent., although the full treatment was not carried out.

I have also other lists of analysis by Dr. Meymott Tidy and Mr. Midwinter which show equally favorable results.

I have also tabulated analyses of my own carried out in 1886, showing the electrolytic action on contaminated canal water.

Here are analyses of samples taken from each section of the shoot, there being six in series. The organic matter is seen to be gradually reduced by the electrochemical action.

I have never seen an effluent, treated in the way described, show any signs of secondary decomposition nor develop sulphureted hydrogen.

In cases where specially prepared or suitable land of a porous nature is procurable, the effluent might be wholly or partially used for manuring crops, in which case the sewage should be only so far treated that the prevention of putrefaction is assured.

The advantage of iron in the soil is one which, I think, every practical man must acknowledge. I had some sludge (deposit after electric treatment) pressed without the addition of lime, and it was applied to vegetables, the result being that a marked difference in favor of iron manure was shown in the crops when compared to others grown with ordinary farm yard manure.

The question of sludge disposal is a difficult one, and as my paper is essentially electrical, I will only mention that I should, where practicable, puddle it with chalk, and run on to waste lands, through wooden conduits, similar to the process of mixing clay and chalk in a washing mill, and running into bays, as carried out in cement manufacture, the only alternatives being filter pressing or shipping out to sea.

The bacteria question is one which has probably still to be settled; but being anxious to have some information as to the action of the iron compound produced by electrochemical decomposition, I had some experiments carried out, with the result that after a given treatment the whole of the bacteria were killed. In the case of experiments carried out in Paris, with ordinary treatment by means of iron electrodes, the results were as follows:

Raw Sewage. Effluent.

Organisms per cubic centimeter. 5,000,000 600

Another experiment in which the effluent was treated still further, so that a slight odor of oxide of chlorine was perceptible, destroyed all organisms, and the liquid remained sterile.

In conclusion, I submit that the application of the electric current in the several ways I have endeavored to describe produces a precipitating and oxidizing action similar to natural processes, in which the organic matter is destroyed by oxidation due to dissolved oxygen slowly absorbed from the air, assisted in many cases by matters in the soil, such as oxides of iron, acting as carriers of oxygen, and I also consider that the question of cost will bear favorable comparison with any process which really does the work attributed to it.

THE SANITARY CONGRESS, ENGLAND.

THIS institute resumed its deliberations in congress at Worcester, on September 26, at the Guildhall, the president, Mr. G. W. Hastings, M.P., in the chair.

The prophylaxis of disease.—Sir Douglas Galton, K.C.B., D.C.L., LL.D., F.R.S., in presence of a large audience, delivered an address on the subject of certain groups of disease which were amenable to the control of preventive measures. These diseases were small-pox, typhus, enteric fever, scarlatina, measles, whooping cough, diphtheria, cholera, and phthisis.

They were now able to point with unerring certainty to the fact that given certain conditions of impure air, impure water, and a soil saturated with filth, sickness and death from one or other of these preventable diseases would ensue.

Commencing with small-pox, the lecturer said that, through vaccination and revaccination, that disease had been almost entirely obliterated in the German army, and largely in German cities. But in England we have not been so careful in enforcing either vaccination or revaccination, and we have suffered, even in recent years, from severe small-pox epidemics.

Typhus fever, which was a common and very fatal disease at the beginning of the century, was essentially associated with overcrowding and destitution. It used to be the inhabitant of our jails, under the name of "jail fever," which was of so infectious a character that on more than one occasion the judge, the jury, and the bar caught the fever from the prisoners in the court.

Typhus was essentially the disease of the pauper and badly housed elements of the community, but wherever it prevailed it might be caught by those around who were within the sphere of its influence.

Scarlatina had no such relation to water supply and drainage as had those other preventable diseases of which enteric fever is a type.

Recent investigations appeared to make it certain that the cow suffered from a disease of the nature of scarlatina, which was in some way very communicable to man through the milk. Hence the necessity of en-

forcing in our houses and farm yards sanitary conditions of cleanliness and pure air.

The laws governing the spread of cholera were well understood by sanitarians. Figures showed that these zymotic diseases, which Dr. Farr has aptly called "filth diseases," had of late years been largely reduced by sanitary means. Sanitation necessarily meant the increased well-being of the people, and especially of the lower class.

Epidemics could only be prevented by making the whole population sanitary, and the speaker proceeded to give some valuable advice on the subject of the conservation of the general health, concluding by producing a number of statistics showing the meaning of the preventable cause of death.

Chemistry, meteorology, and geology.—Dr. J. W. Tripe opened this section with an address, taking for his special subject winds, with remarks on their sanitary effects. He commenced by minutely describing the constituents of the atmosphere, and considered the direction of the wind in relation to its effect on the general health.

Easterly winds in this country were very trying, even to healthy persons, and often fatal to the young and old, causing more deaths in London when combined with fog, in one week, than the most violent blizzard.

He accounted for certain outbreaks of infectious diseases by winds blowing in the direction affected. Some physicians, he said, doubted the possibility of small-pox infection being carried more than a few feet; but he could not understand how, if a disease be set up by a living organism, falling on a soil in which it would develop, it should be able to infect a person at 20 feet distance, and not at 100 feet or even at half a mile.

Surely a living organism could not be destroyed (oxidized) in its passage through the air for half a mile when the wind was traveling at the rate of only four miles an hour; and yet articles of infected clothing and scabs of small-pox they knew would retain infective power for months.

The proceedings of the congress came to a close on September 28, when Prof. W. H. Corfield, M.A., M.D. Oxon. F.R.C.P., addressed a workingmen's meeting at the Worcester Public Hall on "The Mistakes Made in Life and the Remedies for Those Mistakes."

In infancy parents should, above all, not make the mistake of letting their children be too thinly clad, nor commit the common mistake of supplying infants with improper food. The only proper food for children was that which nature provided—the mother's milk. Boiled bread, tea, and starchy foods should be especially avoided in the case of infants until their salivary powers had developed.

The diarrhoea of infancy generally arose from improper feeding and rickets, called by foreigners the "English disease."

One of the greatest mistakes, again, in the treatment of children was not to have them vaccinated before they were three years old. As to their exposure to cold, it was a monstrous mistake for parents to send out their children with bare necks, heads, and legs. Children ought to be clothed from head to foot winter and summer. Children required plenty of sleep, plenty of food, together with variety either in work or play. It was, however, necessary that children should go to bed early. The worst of all habits to acquire in youth was that of drinking alcoholic spirits at any time except at meals, and of drinking "nips."

On the subject of teetotalism he would not trench. Under no circumstances should tobacco smoking be encouraged in youth. At manhood, the time of marrying and giving in marriage, he cautioned his hearers against intermarrying with members of families in which nervous or consumptive diseases were hereditary, as those diseases would be certain to recur in the offspring. At the middle age the most common mistake was overfeeding, and in old age the wearing of scanty clothing, leading to bronchitis.—*Lancet*.

SHAKEN MILK.

By JOHN C. MORGAN, M.D., Philadelphia, Pa.

EVERYWHERE this dietetic paradox confronts the physician, viz., that milk—cow's milk—is the best possible representative food; that it "contains every element of nutrition," hence, that it is the typical diet for the sick of all ages, as well as for the healthy; this on the one hand, and on the other, that there are few articles from which worse results may accrue to individuals, young and old.

"Starving on cow's milk" is a common phrase; and "milk is bilious," or "constipating," or causes diarrhoea, or headache, indigestion, etc.; and these often parry our thrusts at malnutrition. "Acidity of cow's milk," the massiveness of its curd contrasted with human milk, with its fine flaky curd, evidencing faulty digestive processes; its deficiency in oil and sugar—all these are quoted endlessly, to explain the paradox, and doubtless all are significant; but there are other important considerations which are less considered, and these are, in my judgment, largely as follows:

First, human milk, drawn by the child, is a nascent life product. Cow's milk at its first emission is equally so. Secondly, both are living fluids, and their contained cells are the site of vital metabolisms, all, doubtless, promotive of assimilation and of digestion itself. Thirdly, their oil globules and casein granules are sundered and enveloped by their containing shells of albumen and the watery menstruum.

Milk which has died, whether human or cow's milk, has ceased to be nascent, has ceased its living metabolic cell mutations, has become a mere physical or mechanical admixture of bodies of unequal density and specific gravity, whose particles separately mass themselves, and within a few hours, if undisturbed, form crude strata, as cream, heavy caseous milk, and whey; each, after long intervals, becoming very distinct, as is proved by the so-called "candles" formed in the large test tubes in use in condensed milk factories. Preservation on ice does but promote this change. Sterilizing processes, *per contra*, interfere with it, over and above the intended germ destruction, inasmuch as the high heat, with agitation, prevents rapid separation. The housewife recognizes the same principles when preparing "curds and whey," or "slip," with milk and the pepsine-bearing rennet, choosing a cold and quiet place for the setting of her pan, her ob-

ject being to obtain a half-digested, massive, unruptured curd, with its transparent substratum of watery albumino-saline fluid, or whey. Most stomachs can easily complete the digestive process thus begun—for it is nothing else—and it rarely disagrees with anyone. Should it do so, we may, by beating or shaking it, break up the curdy mass (with the aid of an admixture of atmospheric air), thus reducing it to the finely comminuted flaky state so admired in "mother's milk," and intimately mingling it with the whey at our option. Afterward, the process of curdling being complete, these particles have but feeble tendency to reunite; are, indeed, until decay sets in, in excellent condition for the full play of the digestive organs.

Cow's milk, as received from the milkmen, especially in hot weather, has undergone an incipient change of like nature. Chilled and quiescent during the night, the evening's milk is combined with that of the early morning, but both are carefully deprived of all remaining "animal heat." The whole becomes as one by this treatment. The motion of carriage opposes, but the tendency to mechanical separation has already fairly set in. Received now at our dwellings, and transferred to the refrigerator, this separation goes on rapidly, and indigestibility progresses *pari passu*.

To counteract this change, so far as may be, would seem to be the dictate not only of science, but as well of common sense. To prevent the gastric struggle with curdy masses, one need but insure the comminution of those masses, and thus invoke mutually repellent forces of the minute particles of oil, water, and casein. The rapid digestion of each and all of these in gastric and pancreatic juices should now occur without the aid, ordinarily, of pepsin or pancreatin artificially introduced.

Such is the theory I would propound, and I have witnessed a number of cases of its practical and successful application. One of these is a stout florid gentleman, of about sixty years, who is subject to the usual disturbances from drinking even the best quality of milk. The preparation now so popular under the name of "milk shake," at an extremely low temperature, too, agrees with him perfectly, and is readily and speedily digested. Another case is that of a physician, fifty-two years of age, convalescent from malarial fever, for whom I prescribed a milk diet; but who met me with the fatiguing statement that it is always disastrous to him. Lime water did not better the matter. I now advised that it be violently agitated by shaking or beating, with a view to comminution of its massive elements—the oil and the casein—and their thorough diffusion in the whole of the fluid portion; this preparation to be taken in small portions until the teacupful was finished. This was duly accomplished by means of a conical tin cup, such as is used by bar tenders, being closely fitted over the top of a glass of milk, and the whole vigorously shaken for some time just before drinking (in sips, as directed). The result was really charming. His own report was: "Here is a man who never has dared, in many years, to drink a glass of milk, but who now takes it, in the new way, every day, and is building up on it."

The use of milk just drawn from the cow is also important for infants and weakly persons; but most people can do admirably well, I opine, on "shaken milk."

Judging from my own experience, I think it is not too much to predict that in the future the medical and other attendants in typhoid cases, perhaps in infantile disorders and in many others in which patients refuse everything in the way of "sick diet," and crave everything which they must be denied—particularly as to those who "cannot take milk"—will find the solution of the perplexing but essential problem in providing, as an indispensable utensil, the bar room tin, and regularly using it, in the preparation of shaken milk.

A dilution of milk with one-tenth of water "scalded," not boiled, and taken hot, or even ordinary hot milk, is a noble stimulant (*versus* alcohol) in threatened collapse, and in debility in general. If shaken, also, it must prove invaluable in a wide range of low cases.

When a cold drink is more suitable, as in some febrile conditions, cracked ice may be added to milk before shaking; and lastly, when the taste is fastidious, strawberry or other fruit sirup, or any other approved ingredient, may also be introduced.—*Med. Record*.

THE STRENGTH OF ALLOYS AT DIFFERENT TEMPERATURES.*

By Professor W. C. UNWIN, F.R.S.

THE strength of the commonly used alloys, such as gun metal and brass, at moderately high temperatures, is a question of some practical importance. It is well known that iron and copper decrease in tenacity as the temperature is raised, the latter in a very marked degree. There are also experiments showing a still more considerable decrease of tenacity in gun metal. The author's attention was directed to the matter in studying some experiments made for the Admiralty in 1877. In these experiments, copper, Muntz metal, and phosphor bronze showed a tolerably regular decrease of tenacity, as the temperature was raised to 500 deg. Fah. But in the case of gun metal the results were more anomalous. The gun metals tried were all alloys of copper, tin, and zinc. In the bars tried the tenacity diminished tolerably regularly up to a temperature of 300 deg. or 350. But beyond that temperature there was a sudden decrease of tenacity, generally, of more than 50 per cent., and at a temperature of 500 deg. in several cases the tenacity had become *nil*. Now at the high pressures, and correspondingly high temperatures, at which steam engines are often worked, gun metal is exposed in many cases to temperatures of 350 deg. or 400 deg. It is practically important to know if at such temperatures its strength is seriously impaired. At any rate, the author found that there were but few experiments on the strength of alloys at different temperatures, and of some of these the trustworthiness was doubtful. Hence it appeared that it might be useful to make some new experiments.

In the present experiments the bars to be tested were fixed in an oil bath, heated by a gas jet. The middle part of the bar for a length of 2 in. was turned down to a diameter of $\frac{1}{4}$ in. or $\frac{5}{8}$ in. The temperatures were taken by a mercurial thermometer. It is believed that the temperatures are quite accurate, except those

* British Association, Section G.