Practical Points.

Substitutes for Rubber Gloves in Surgery.

Dr. Murphy, of Chicago, has recently called attention to a substitute for rubber gloves. He suggests the use of gutta-percha dissolved in benzine. According to him, this coats the hands with an impervious coating which is claimed to be superior to rubber gloves.

Another substitute has been suggested by Dr. F. H. Weggin. He prepares the following :—49½ ozs. alcohol (96 per cent.), 49½ ozs. ether, ½ oz. celloidin, and 1 oz. castor oil. The hands of the operator are sterilised, and then dipped in this solution. This gives a thick, firm, dry, elastic coating that does not crack, and is not soluble in water or ordinary alcohol. It can be removed by washing in equal parts of alcohol and ether. This substitute has given Dr. Weggin the greatest satisfaction.

Purification of Drinking Water by Ozone.

Dr. Erlwein, of Berlin, at the forty-third annual meeting of the German Union of Gas and Water Engineers, speaking on this subject, said he divided natural waters into deep and surface waters. The former protected from contamination by impermeable strata of clay, and after passing through great thickness of sand has been so filtered that it is practically free from bacteria, and requires no purification except it be from iron salts. Surface waters invariably require purification both from organic matter and pathogenic bacteria.

The processes of purification may be classified as follows :—(1) Mechanical, (2) chemical, (3) mechanico-chemical, (4) thermometrical, (5) electrolytic. The last three require little notice :—

1. Mechanical methods resolve themselves practically into filtration, and this on a large scale is done by sand. The proper action of such a filter depends upon a supposition not always realised, viz., that the mud layer which forms on its surface and is the real bacteria filter should remain unbroken. This is an essential condition, and requires careful management and supervision.

2. The purely chemical methods can be sub-divided into two : (*a*) the older processes and (*b*) the ozone process. The former consists of sterilisation by chlorine and other powerful reagents, the quantity of which to be used was difficult to determine, and the unavoidable excess of which had to be removed from the water before it could be drinkable. The ozone treatment necessitates no such after treatment as the excess of the sterilising agent decomposes spontaneously. Ozone is not only a bactericide, but frees water so perfectly from iron that it may well be used for that purpose alone.

As regards ozone and its preparation, it may be remarked that ozone is an active modification of oxygen, of peculiar odour, and lightly soluble in water, where it kills the bacteria and burns the dead organic matter. In burning this matter it becomes converted into oxygen. Ozone may be prepared either chemically or electrically. The latter is the only practicable method on a large scale, and consists in subjecting oxygen or air to a silent electrical discharge in apparatus of various construction. The air of oxygen best freed first from water vapour is driven at low pressure through a space filled with the blue brush discharge. The ozone is then brought into contact with the sprayed water in a tower.

Dr. Erlwein next explained the ozone process as carried out at Weishaven and Paderborn. Paderborn may be regarded as the most typical example. The plant there has provided the whole of the drinking water of the town for nearly a year. It was built by Siemens and Halske for an hourly yield of 60·80 extra metres. It consists of a direct current dynamo, centrifugal pumps, a transformer and a blower, all driven by one gas engine. In a separate room is a battery of nine ozone apparatuses, and there are two sterilisation towers. The ozone apparatuses are of the Siemens' tube type, in which the electrifying space consists of a glass cylinder with an internal metal cylinder, such an apparatus, working at about 8,000 volts, requires one horse-power, and delivers from 240,000 to 480,000 litres of sterlised water per twenty-four hours.

The sterilisation invers are of concrete and four metres high. The water in them trickles down over pebbles and meets the ozonised air coming up from below. Each tower has a supply reservoir above and a collecting reservoir for the purified water below. The pebble bed is 2 metres thick, and is supported by an iron grating. It is fed with water by a four-armed sprinkler ; the internal section of each tower is 1 square metre, and through it pass per hour 15 to 20 cubic metres of water and 30 to 40 cubic metres of ozonised air. The air passes from ozone apparatus to tower and back again in continuous circulation, an inlet being provided to supply what is consumed. The ozonised water from the Paderborn towers escapes from the collecting reservoirs in their cascades to allow the escape of the ozone, which takes place rather longer with Paderborn ; but the high pressure system is perhaps best for many ferruginous waters. Precautions are taken to cut off the water supply to the towers in case of accidental interruption of the supply of ozone, great care is taken to protect the attendants from the high voltage used.

As regards the chemical effect of the ozonisation of water, it diminishes the oxidation degree of the water by 15 to 20 per cent., and increases its content of free oxygen. The expense of ozone purification depends mainly on whether filtration is or is not essential.

In conclusion Dr. Erlwein remarks that the use of ozone is out of question when a good surface water can be had cheaply, which is often but not always the case. The ozone process, too, must not cause one to forget the immense value of sand filtration in spite of the unquestionable efficacy of ozonisation in killing bacteria which sand-filtration only diminishes in number. The ozone process should be seriously considered where difficulties arise in large towns as regards extending already existing filter beds or making new ones when they need the acquisition of land at heavy expense. The ozone plant is also excellent for places where it is impossible to rely too much on the water-works staff. For this reason various colonial authorities are seriously considering water purification by ozone. There are cases, too, in which iron and organisms giving taste and smell to the water can only be removed by ozone. In short, every system must be judged independently for the determination of the most suitable system or systems for purifying water.

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