which must be disposed of after the chlorine is removed. When this method is used the usual practice is to have two or more tanks, one in which the bleaching powder is mixed with water to the consistency of a cream, either by hand or where necessary by mechanical means, allowed to settle, and the supernatant fluid drawn off into a second tank from which it is passed over a weir, through a grid, or by any scheme found mechanically acceptable, into the water to be disinfected.

Save under exceptional circumstances the proportion to the water to be treated is very small, one part to one million or less, according to the quality of the water and the degree of pollution. This proportion is of course in terms of available chlorine. The method is in use in a number of cities abroad and in the United States and when the chlorine is used in these amounts causes no complaints from the consumer. Certain very important facts must be kept in mind when using chlorine as a disinfectant. In the first place it is a strong corrosive and the materials in which it is kept must be constructed with this in view. The fumes from the raw material, or the concentrated solution, are very irritating and precautions must be taken on the part of the workmen. If the proportion used is too high, it will be smelt and tasted in the water and will cause complaints. When used in the dilutions noted above, there will be practically complete disappearance in an hour or less, so that if possible this time factor between introduction of the chlorine and the distribution to the first users on the line should be adhered to. In some cities, however, it is stated that the time factor is notably less and that there is no complaint.

In regard to all these methods as a whole there are certain broad lines of action. It must be remembered that the action of the disinfectant is on organic matter, which is broken up to a greater or less degree depending on its individual chemical composition. Bacteria are affected differently according to their varieties and the spore formers are less acted on than the non-spore formers. Fortunately the organisms of the ordinary water-borne diseases such as typhoid, dysentery and cholera hove no spores, and are readily killed. The index of the efficiency therefore can be the amount of destruction of the colon bacilli, as these are slightly more resistant than the typhoid and accordingly any measures that will take care of them will also take care of their more dangerous relatives.

In the next place none of these methods have any particular effect on the appearance of the water and will have no influence on the turbidity or the color. For the removal of these or for treatment of the hardness it will be necessary to use the standard methods. The use of chlorine has a tendency to increase the permanent hardness slightly, but in the small amounts used will not make a material difference.

Lastly, these disinfections are not intended to supply the place of a pure supply. While in suitable proportions they will remove the dangerous organisms even from the sewage, there will be certain changes which will cause a taste in the water and the sewage chemicals will still be present. The disinfection is not a panacea which will admit of drinking sewage with impunity.

In summation then, we have certain agencies which may be applied to water supplies which are not above suspicion and which will make them safe as far as the organisms of infectious disease are concerned. They are of great value in that respect and may be used either in raw waters which are not to be further treated or in filtrates where the efficiency of the filter varies from one cause or another, or where the expense of construction may be lowered by the combination of a comparatively low power filter and a disinfection process. Of the methods at present available the bleaching powder is perhaps the simplest and the cheapest, and is in use in more places. If the dilution is high, and the time factor before delivery is cared for there will be no complaints.

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This is in no way intended to be a complete list, but gives an indication of the main sources of information, for further reading where desired.

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WATER RESOURCES OF MINNESOTA.

The coöperative agreement between the United States Geological Survey and the Minnesota State Drainage Commission for the purpose of investigating the water resources of Minnesota has recently been renewed, and in consequence of an appropriation of $30,000 made by the legislature for two years' work, the investigations are being extended into portions of the state not previously touched.

The general plateau level of the northeastern portion of Minnesota, the section which lies north of Lake Superior and is contained chiefly in Lake and Cook counties, is more than 600 feet above Lake Superior. Numerous streams drain this region into the lake, and although they are small the fact that they descend 600 feet within a few miles of the lake makes them important as sources of water-power. Many of the streams pass through canons having vertical walls which would make excellent dam sites. The investigation has been started by making a survey of Pigeon (which forms the extreme eastern boundary between Minnesota and Ontario), Brule and Deviltrack rivers. Other streams to be surveyed are Cascade, Poplar, Temperance, Cross, Manitou, Baptism, Beaver and Gooseberry rivers. Besides the streams in the northeastern portion of the state, Vermilion, Big Fork and Little Fork rivers are being surveyed.

Measurements of the flow of the rivers are also being made, to determine more fully their value for water power.