

not provided, the nuisance of open privies may be best avoided by the use of the so-called earth-closet.

If a sewer is much complained of, as stinking into the public way, generally the presumption is, that, from original ill-construction or some other cause, it does not properly fulfil its object, but has filth accumulated and stagnant in it; and such a sewer, besides occasioning nuisance in the public way, may be the source of serious danger to the inhabitants of houses which drain into it. It is most important that all sewers should be well ventilated at points where their effluvia will be least injurious; and ordinary drain pipes may be used to conduct the effluvia to a distance.

For convenience, in this memorandum, the word "disinfectants" is used to cover, not only those true disinfectants which permanently destroy infective matter, but also those agents which merely arrest the process, or absorb the offensive products, of organic decomposition.

For artificial disinfection on a large scale, the agents which most commonly prove useful are quick-lime, chloride of lime, carbolic acid, sulphate of iron, perchloride of iron, and chloride of manganese. The following are also efficient disinfectants, but, as being dearer, are less suited for large operations: sulphate of zinc, chloride of zinc, chloride of soda, and permanganate of potash. In certain cases chlorine gas, or nitrous acid gas, or sulphurous acid gas, may advantageously be used; and, in certain other cases, powdered charcoal or fresh dry earth.

Quick-lime ought to have been recently burnt, and may be used, either in the form of dry powder, or, stirred up with about ten times its bulk of water as milk of lime. Chloride of lime is best used with water, and thoroughly mixed with it, in the proportion of a pound to the gallon; or, of the solution, as commonly sold, about two pints may be mixed with a gallon of water. Carbolic acid (in the fluid form in which it is commonly sold) should be dissolved in about eighty times its volume of water, with which it must be mixed by strong shaking in a closed vessel. Sulphate of iron should be dissolved in ten times its weight of water; a solution which is best effected by employing hot water and stirring. Of perchloride of iron and chloride of manganese, the common concentrated solutions may be used, diluted with ten or twelve times their bulk of water. Sulphate of zinc should be dissolved in about ten times its weight of warm water. Of chloride of zinc, the common concentrated solution may be diluted with eight or ten times its bulk of water.\* Of chloride of soda, the common solution may be used like that of chloride of lime. Of permanganate of potash an ounce may be dissolved in a gallon of water.†

All disinfectants must be used in quantities proportionate to the amount of matter or surface to be disinfected. When the matters requiring to be disinfected have an offensive smell, the disinfectant should be used till this smell has entirely ceased; and as often as the smell recurs, the disinfectant must again be used.

1. During the emptying of privies and cesspools, and whenever else temporary disinfection is required for them, carbolic acid, or sulphate of iron, or perchloride of iron, or chloride of manganese, or chloride of zinc, will be found available. A dilute solution (as above) of one of those agents should be poured into the privy or cesspool, from a quart to a pailful at a time, till the desired effect is obtained. Especially where cholera or typhoid fever is present, privies and cesspools ought to be very frequently flooded in this manner. The best test of their being adequately disinfected, is the entire absence of fæcal or ammoniacal odour.

2. Heaps of manure or other filth, if it be for the time impracticable or inexpedient to remove them, should be covered, to the depth of two or three inches, with a layer of freshly-burnt vegetable charcoal in powder. Freshly-burnt lime may be used in the same way, but is less effective

\*Or the preparations respectively known as Burnett's and Crewe's disinfectant solutions may be employed.

†Or Condy's disinfectant fluids, which contain manganic and permanganic salts, may be used.

than charcoal. If neither charcoal nor lime be at hand, the filth should be covered with a layer, some inches thick, of clean dry earth. For a privy which has only solid contents, the same sort of treatment is applicable. Earth near dwellings, if it has become offensive or foul by the soakage of decaying animal or vegetable matter, should be treated on the same plan.

3. If running sewage, about to be used in agriculture, require to be disinfected, the chloride of manganese or perchloride of iron may be best used;\* but if the sewage is to pass into a river, or into any pond or canal, where it might again become offensive, chloride of lime is to be preferred; and in this case a pound of good chloride of lime will generally suffice to disinfect 1,000 gallons of the sewage. For foul ditches and other stagnant drainage, chloride of lime is also the proper disinfectant.

4. Where it is desirable to disinfect, before throwing away, the evacuations from the bowels of persons suffering from cholera or typhoid fever, some of the disinfectant (which here may best be chloride of lime) should be put into the bed-pan or other vessel before it is used by the patient, and some more should be added immediately after. Its thorough mixture with the evacuation should be ensured. Care should also be taken that portions of the discharges do not remain about the patient's body, or in his dress.

5. Linen and Washing Apparel requiring to be disinfected may be set to soak in water containing per gallon about an ounce either of the common clear solution of chloride of lime, or of that of chloride of soda. Or the articles in question may be plunged into boiling water, and afterwards, when at wash, be actually boiled in the washing-water.

6. Woollens, Bedding, or Clothing, which cannot be washed, may be disinfected by exposure for two or more hours, in chambers constructed for the purpose, to a temperature of F. 210°-250°. When this cannot be done, the natural disinfecting process of prolonged exposure to air, sun, and rain, ought to be had recourse to.

7. For the disinfection of the interior of houses, the ceilings and walls should be washed with quick-lime water.—The wood-work should be cleansed with soap and water, and subsequently washed with water containing in each gallon about two ounces of the clear solution of either chloride of lime or chloride of soda.

8. A room no longer occupied may be disinfected by chlorine gas, or nitrous acid gas, or sulphurous acid gas.—And for this purpose the gases may be produced in the room as follows:—chlorine gas, by pouring over a quarter of a pound of finely powdered black oxide of manganese, contained in a jar, half a pint of muriatic acid previously mixed with a quarter of a pint of water, or by pouring over a quarter of a pound of chloride of lime, contained in a jar, a quarter of a pint of muriatic or dilute sulphuric acid;—nitrous acid gas, by pouring over an ounce of copper shavings or turnings, contained in a deep jar, three ounces of concentrated nitric acid;—sulphurous acid gas, by burning an ounce or two of flower of sulphur in a pipkin. The process of disinfecting a room by any of these gases requires several hours; and while it is going on, all doors, chimneys and windows of the room must be kept carefully closed.—Precautions to this effect should have been taken before the chemicals are mixed, as the person who starts the process (having to avoid the gases) must not afterwards loiter in the room. When the process is at an end, doors and windows should be fully opened.

9. Ships (except the class of cattle-ships, for which special treatment is required) may be disinfected on the same plan as houses. The process should be conducted as distantly as may be from the shore and from other vessels. All the compartments of the ship should first be fumigated with some disinfectant gas, best with chlorine or nitrous acid, and then all the accessible wood-work (in and out) should be washed with a solution of chloride of soda or lime. The bilges require particular attention, and before they are first pumped, some pounds of chloride of lime in water, or some gallons of solution of perchloride of iron, should be poured

\*In some such cases McDougall's process, as practised by him at Carlisle, may be applicable. And his powder may also be applicable to cases mentioned in § 1.