Disinfection and Disinfectants.

(*Continued from page* 69.)

Boiling for half an hour will destroy the vitality of all known disease germs, and there is no better way of disinfecting clothing or bedding which can be washed than to put it through the ordinary operations of the laundry. No delay should occur, however, between the time of removing soiled clothing from the person or bed of the sick and its immersion in boiling water or in one of the following solutions; and no article should be permitted to leave the infected room until treated with standard solution No. 3.

Dissolve four ounces of corrosive sublimate and one pound of sulphate of copper in a gallon of water.

Two fluid ounces of this standard solution to the gallon of water will make a suitable solution for the disinfection of clothing. The articles to be disinfected must be thoroughly soaked with the disinfecting solution and left in it for at least two hours, after which they may be wrung out and sent to the wash.

[N. B.—*Solutions of corrosive sublimate should not be placed in metal receptacles,* for the salt is decomposed and the mercury precipitated by contact with copper, lead, or tin. A wooden tub or earthen crock is a suitable receptacle for such solutions.]

When diluted as directed, this solution may be used without danger from poisoning through the medium of clothing immersed in it or by absorption through the hands in washing. A poisonous dose could scarcely be swallowed by mistake, owing to the metallic taste of the solution and the considerable quantity which would be required to produce a fatal effect.

Clothing may also be disinfected by immersing it for four hours in a two per cent solution of carbolic acid.

Clothing or bedding which cannot be washed or subjected to the action of steam may be disinfected by exposure to dry heat in a properly constructed disinfecting chamber for three or four hours. A temperature of 230° Fah. should be maintained during this time, and the clothing must be freely exposed, *i. e.*, not folded or arranged in piles or bundles, for the penetrating power of dry heat is very slight.*

The temperature above mentioned will not destroy the *spores* of bacilli, *e. g.*, of the *Anthrax bacillus*, but is effective for the destruction of all disease germs which do not form spores; and there is good reason to believe that this list includes smallpox, cholera, yellow fever, diphtheria, erysipelas, puerperal fever, and scarlet fever (?) Moist heat is far more effective, and it is demonstrated that ten minutes' exposure to steam at a temperature of 230° Fah. will destroy all disease germs, including the most [illegible] spores.

In the absence of a suitable chamber for the use of dry heat, fumigation with sulphurous acid gas may be resorted to. The room in which disinfection is practiced should be hermetically closed to prevent the escape of the gas, and three pounds of sulphur should be burned in it for every 1,000 cubic feet of air space. Expose the articles to be disinfected as freely as possible by hanging them up in the disinfecting chamber, and leave them at least twelve hours subjected to the action of the sulphurous acid gas.

Soiled mattresses, pillows, feather beds, and other articles of this nature cannot be effectually disinfected by sulphur fumigation, owing to the fact that the gas does not penetrate to their interior in sufficient amount. For articles of this kind, and in general for articles of little value, which have been soiled by the discharges of the sick, destruction by fire will be advisable.

Disinfection of the Sick Room.—In the sick room no disinfectant can take the place of free ventilation and cleanliness. It is an axiom in sanitary science that *it is impracticable to disinfect an occupied apartment,* for the reason that disease germs are not destroyed by the presence in the atmosphere of any known disinfectant in respirable quantity. Bad odors may be neutralized, but this does not constitute disinfection in the sense in which the term is here used. These bad odors are, for the most part, an indication of want of cleanliness or of proper ventilation; and it is better to turn contaminated air out of the window, or up the chimney, than to attempt to purify it by the use of volatile chemical agents, such as carbolic acid, chlorine, etc., which are all more or less offensive to the sick, and are useless so far as disinfection—properly so called—is concerned.

When an apartment which has been occupied by a person sick with an infectious disease is vacated, it should be disinfected.

The object of disinfection in a sick room is, mainly, the destruction of infectious material attached to surfaces, or deposited as dust upon window ledges, in crevices, etc. If the room has been properly cleansed and ventilated while still occupied by the sick person, and especially if it was stripped of carpets and unnecessary furniture at the outset of his attack, the difficulties of disinfection will be greatly reduced.

All surfaces should be thoroughly washed with *standard solution No.* 1, diluted with three parts of water, or with 1 : 1,000 solution of corrosive sublimate.

* The limitations with reference to the use of dry heat as a disinfectant are stated in the paper on dry heat.

Standard solution No. 3, diluted in the proportion of four ounces to the gallon of water, may be used.

The walls and ceiling, if plastered, should be brushed over with one of these solutions and subsequently washed over with a lime wash.

Especial care must be taken to wash away all dust from window ledges and other places where it may have been settled, and to thoroughly cleanse crevices and out-of-the-way places. After this application of the disinfecting solution, and an interval of twenty-four hours or longer for free ventilation, the floors and woodwork should be well scrubbed with soap and hot water, and this should be followed by a second more prolonged exposure to fresh air, admitted through open doors and windows.

As an additional precaution, fumigation with sulphurous acid gas is to be recommended, especially for rooms which have been occupied by patients with smallpox, scarlet fever, diphtheria, typhus fever, and yellow fever. But fumigation with sulphurous acid gas alone, as commonly practiced, cannot be relied upon for disinfection of the sick room and its contents, including bedding, furniture, infected clothing, etc., as is popularly believed.

When fumigation is practiced, it should precede the general washing with a disinfecting solution, heretofore recommended.

To insure any results of value, it will be necessary to close the apartment to be disinfected as completely as possible, by stopping all apertures through which the gas might escape, and to burn not less than three pounds of sulphur for each thousand cubic feet of air space in the room. To secure complete combustion of the sulphur, it should be placed in powder or in small fragments in a shallow iron pan, which should be set upon a couple of bricks in a tub partly filled with water, to guard against fire. The sulphur should be thoroughly moistened with alcohol before igniting it.

Disinfection of Privy Vaults, Cesspools, etc.—When the excreta (not previously disinfected) of patients with cholera or typhoid fever have been thrown into a privy vault this is infected, and disinfection should be resorted to as soon as the fact is discovered, or whenever there is reasonable suspicion that such is the case. It will be advisable to take the same precautions with reference to privy vaults into which the excreta of yellow fever patients have been thrown, although we do not definitely know that this is infectious material.

The most trustworthy agent for this purpose is corrosive sublimate.

The amount used must be proportioned to the amount of material to be disinfected.

Use one pound of corrosive sublimate for every five hundred pounds (estimated) of fecal matter contained in the vault.

Solution No. 3, diluted with three quarts of water, may be used. The diluted solution should be applied in the proportion of one gallon to every four gallons (estimated) of the contents of the vault.

All exposed portions of the vault, and the woodwork above it, should be thoroughly washed down with the disinfecting solution.

To keep a privy vault disinfected during the progress of an epidemic, sprinkle chloride of lime freely over the surface of its contents daily. Or if the odor of chlorine is objectionable, apply daily four or five gallons of *standard solution No.* 2, which should be made up by the barrel, and kept in a convenient location, for this purpose.

Disinfection of Ingesta.—It is well established that cholera and typhoid fever are very frequently, and perhaps usually, transmitted through the medium of infected water or articles of food, and especially milk. Fortunately we have a simple means at hand for disinfecting such infected fluids. This consists in the application of heat. *The boiling temperature maintained for half an hour kills all known disease germs.* So far as the germs of cholera, yellow fever, and diphtheria are concerned, there is good reason to believe that a temperature considerably below the boiling point of water will destroy them. But in order to keep on the safe side, it is best not to trust anything short of the boiling point (212° Fah.) when the object is to disinfect food or drink which is open to the suspicion of containing the germs of any infectious disease.

During the prevalence of an epidemic of cholera it is well to boil all water for drinking purposes. After boiling, the water may be filtered, if necessary, to remove sediment, and then cooled with *pure* ice if desired.

The Smell of Paper Money.

In speaking of a recent defalcation at the Troy post office, a gentleman said: "It is never safe to inclose an old bill in an envelope to be sent by mail. Why," said he, "men who are experts can tell whether a letter contains money or not simply by the sense of smell. If you will notice an old greenback, it has a peculiar smell about it that can readily be perceived, even if it be inclosed within a letter. It is better to send a registered letter or a postal note, or, if you inclose a bill, be sure it is a new one. That will not smell."—*Albany Journal.*

The Chemical Composition of Man.

From a chemical point of view, man is composed of thirteen elements, of which five are gases and eight are solids. If we consider the chemical composition of a man of the average weight of 154 pounds, we will find that he is composed in large part of *oxygen*, which is in a state of extreme compression. In fact, a man weighing 154 pounds contains ninety-seven pounds of oxygen, the volume of which, at ordinary temperature, would exceed 980 cubic feet. The *hydrogen* is much less in quantity, there being less than fifteen pounds, but which, in a free state, would occupy a volume of 2,800 cubic feet. The three other gases are *nitrogen*, nearly four pounds; *chlorine*, about twenty-six ounces; and *flourine*, three and a quarter ounces. Of the solids, *carbon* stands at the head of the metalloids, there being forty-eight pounds. Next comes *phosphorus*, twenty-six ounces, and *sulphur*, three and a quarter ounces. The most abundant metal is *calcium*, more than three pounds; next *potassium*, two and a half ounces; *sodium*, two and a quarter ounces; and lastly, *iron*, one and a quarter ounces. It is needless to say that the various combinations made by these thirteen elements are almost innumerable.—*Le Practicien.*

The Effect of the Sun's Rays on Selenium.

At a recent meeting of the Swedish Royal Academy of Sciences, Prof. E. Edlund, the celebrated Swedish electrical *savant*, read a paper on the effect of the sun's rays on selenium, describing the most recent experiments made with that substance on this point, particularly in Sweden, of which the following is a *resume:*

Some twelve years ago it was announced to this society that the metal selenium, discovered by Prof. Berzelius, had a greater electrical conductivity when exposed to the rays of the sun than in a dark chamber. This applies to the crystalline form of selenium, whereas in the amorphous state it is a bad conductor of electricity. This remarkable peculiarity of selenium has, since, many times been the subject of research in several countries, and particularly among Swedish *savants*, the results of which are that it has been discovered that the effect of the light varies under different kinds of light, and that it is, moreover, so powerful that the electrical resistance under favorable conditions, in bright sunshine, is not more than six or seven per cent of its magnitude when the metal is in a dark chamber. During the last few years these researches have been resumed by electrical *savants*, who have succeeded in demonstrating some other important electrical peculiarities possessed by this metal.

The selenium is melted on a metal disk, with which it can form some chemical combinations, and is distributed in a layer, the thickness of which is only two or three hundredths of a millimeter. On this layer of selenium a gold leaf is pressed, so thin in texture that the sun's rays can penetrate it and reach the layer of selenium. Now, if this composition be exposed to the influence of the sun's rays, and its electrical resistance be tested by leading an electrical current from the gold leaf to the metal disk below, it will be found that sometimes the conductivity will decrease to one-third per cent of what it is when the element is placed in the dark. By this method the sensitiveness of selenium to the light has been found twenty times greater than was formerly known to be the case. Moreover, it has been demonstrated by these researches that the resistance of the selenium depends upon the direction of the electrical current, the resistance being fifteen to twenty times greater if the current runs from the gold leaf to the metal disk than *vice versa.* This phenomenon, which was demonstrated in a dark chamber, seems to indicate that the chief obstacle to the continuity of the current must be sought in the point of transmission between the gold leaf and the selenium layer, or between that of the latter and the metal disk, as any difference in the resistance offered by the selenium itself, whether the current runs in one or the other direction, is impossible. This view is also supported by the circumstance that the resistance was dependent upon the strength of the current as well as upon the electromotive force of the battery.

Another discovery, also of interest and importance, was made. If the gold leaf and the metal disk, between which the selenium layer is placed, were connected by means of a wire attached to a galvanometer, it showed that the electric current began to circulate as soon as the gold leaf came under the influence of the sun's rays, and that even the beam of the moon on the light of a lamp made the element active. This being a fact, we may ask whether the light at the points of contact between the selenium layer and the metals with which the latter is surrounded effects some chemical change, whereby the formation of a current is caused, or whether the active force possessed by the light is immediately transformed into an electric current? As the current commences at the moment the element is subjected to the light and ceases the moment the latter is removed, the last mentioned solution seems really the most natural. This being as it may, we have by these experiments obtained a dry pile, a pile without acids, which may lead to the discovery of other secrets