15 lb. pressure for thirty minutes at most. Indeed, I have placed dried cultures of Staphlococcus aureus and Staphyloccus albus in the pockets and sleeves of two coats rolled loosely together, and have attained sterility in ten minutes with steam under 10 lb. pressure.

The preparation of the hands for surgical work is a subject that has interested me greatly. The potassium permanganate oxalic acid portion of the process has always excited my wonder. Three explanations have been given me of the necessity or advisability of this treatment, namely:—1. That the permanganate destroys bacteria. 2. That it oxidises the organic matters adherent to the skin. 3. That when one stains the hands in every part with permanganate and then removes the stain with oxalic acid, the hands are clean. As to the assertion that it destroys bacteria:—I have experienced with saturated permanganate solution against Staphylococcus aureus and albus, Bacillus coli, and Bacillus pyocyaneus, and have found that ten minutes' exposure is ineffective against all but the last-mentioned. These results were obtained not once, but several times. As to the oxidation of organic matter:—Potassium permanganate is preeminently an oxidiser for organic matter. On dipping the hands into a saturated solution, they are stained a deep brown, owing to the precipitation of a lower oxide, oxygen having been given up to the epidermal scales and other organic matter. This deposit of the lower oxide is soluble in oxalic acid, which thus restores the normal colour of the hands. It is assumed that the organic matter (just what harm it will do, unless it is in the form of bacteria, I do not know) is completely oxidised and disposed of. Dip the hands, however, a second time, and see what happens. The same thing. Repeat it. Again it happens, and again, and again, and again. This is due to the fact that, immediately on contact with organic matter, the permanganate is reduced and the hands become, as it were, plated with the precipitated lower oxide, which acts as a bar to further action of the permanganate upon the parts immediately beneath the plating, just as the albuminate of mercury prevents the further action of corrosive sublimate. A short time ago, I tried the experiment of treating my hands first with permanganate and then with oxalic acid, repeating the process until further treatment failed to give the characteristic brown stain. On the twenty-first trial, the stain was observed to be less intense, and so on to the twenty-fifth, when the experiment was discontinued. From this it would appear that to oxidise all the organic matter possible by this means is an endless task. After twenty-five treatments, I washed my hands with soap and water, and after repeated rinsing in running wat I dipped them again into the permanganate solution. At once the original dark-brown stain appeared as intensely as ever; I was then oxidising the traces of soap, which, in spite of continued rinsing, adheres tenaciously to the skin, as is proved by the great difficulty one observes in removing, by rinsing, the odour of a scented soap after washing therewith.

As to the statement that a hand once stained and decolourised is necessarily clean, there is but little to say. A dirty hand may be stained and decolourised as well as a clean one, but the dirt remains. Permanganate removes no dirt and destroys only weakly-resistant bacteria.

After thorough brushing with hot soapsuds, what agent can be relied upon to kill the bacteria that have not been removed? Not corrosive sublimate 1-1000, if we soak the hands a quarter-of-an-hour; not creolin 1-20, if we soak them much longer; not lysol, nor solveol, nor bacillol, nor sulpho-naphthol; not peroxide of hydrogen; not sublamin; not mercuric cyanide; not even formaldehyde in 5 per cent. solution, even though the skin could stand it All of these agents and several others I have tested under the most favourable conditions against the common pus organisms, and all failed to kill within reasonable periods. Without going unnecessarily into details, I will give my results as briefly as possible. A little more than a year ago, I published the results of a series of experiments which demonstrated, among other things, that corrosive sublimate, 1-1000, requires more than ten minutes' contact to kill Staphylococcus albus, and that weaker solutions (1-5000) act far more slowly. Recently I tried 1-500, which solution is too strong and irritating for general application, and found that it would kill Staphylococcus aureus in from sixty to ninety seconds, and the other pyogenic organisms in from forty to sixty seconds. With 1-100, I found that the aureus was killed after twenty seconds. Now, if 1-100 cannot destroy pus cocci in twenty seconds, and 1-500 can do so only after a minute, and 1-1000 only after ten minutes, what measure of disinfection does the surgeon attain who merely dips his hands into the solutions of corrosive sublimate in common use for only a few seconds and then rinses them off with sterile water or salt solution?

In my tests of the germicidal power of other disinfectant solutions, I employed a number of different species of bacteria; but in the brief report of results now to be made, I will deal only with that pyogenic organism which is the most common and also the most resistant—Staphylococcus pyogenes aureus.

The following table shows the number of minutes that the organism mentioned remained in contact with the several disinfectants without injury, and also the shortest exposure observed that was sufficient for its destruction. The intervals adopted were as follows: Thirty seconds, 1, 2, 3, 4, 5, 7, 10, 15, 30, 45, and 60 minutes. In only one case was the exposure longer than sixty minutes, and then the agent failed to kill in three hours.

previous page next page