

times some failures will occur, but on the whole they are not troublesome. So far as disease transmission is concerned, people who are suffering from anything very serious are not likely to ask admission to the pool, and if they do ask admission, it is the watcher's business to keep them out. I believe that there is less trouble in the matter of damaging the pool from specific diseases than people imagine, due very largely to the fact that people who are suffering therefrom do not care about entering the bath, and certainly they do not care to be caught doing so. We do not ask that a man with a slight cold shall refrain from bathing. In some places they do ask that, but it is carrying the protection of the water pretty far. I have no doubt a man with a mild cold can easily get by without being detected and get to the pool if he wants to go.

Temperature, Color and Turbidity

At what temperature is it best to keep the water? At Rensselaer we keep the pool at 76°, except on the occasion of a swimming match of some kind and then we run it down to 72° merely to put a little "pep" into the men who are performing. Under ordinary conditions if one is going in simply for the pleasure of having a dip, or for learning how to swim, anything short of 74° or 76°, makes it a rather strenuous undertaking. In the summertime, a swim in the open is quite different, and one can stand cold water then very well, but with a pool under cover in the winter time, unless the water is up in the seventies, a bath feels uncomfortably chilly. Of course, a Turkish bath is a different proposition; a cool pool is needed under those circumstances in order to start a reaction from the very high temperature to which the bather has been exposed.

High color or turbidity is unsightly and masks such undesirable floating material as sputum, but beyond that either may be absolutely dangerous. I have in mind what happened at one of our large institutions not many years ago. The pool was very turbid and on draining it, a man who had been missing for some days was found at the bottom. Unless the bottom of a pool can be seen, it is better not to use it. A prominent girls' school has recently closed its pool on account of the turbid character of the water. While it was still in use, whenever a group of girls went in, the teacher had to keep watch all the time to see if somebody was missing. A turbid pool is very dangerous and should not be tolerated. A color or turbidity small enough to be possibly unobjectionable in a drinking glass might be sufficient to prevent the bottom of a pool being seen through a depth of eight or nine feet. Partly in this connection, it may be permitted to add that at one of our universities a fatality was occasioned by a student diving into an empty pool at night. Such an accident can, of course, be guarded against by suitable rules controlling admission.

Suction Sweeper Removes Fibre

To remove the sediment which collects at the bottom of the pool we use a sweep at Rensselaer and push everything that settles, onto the top of the outlet grating, whence it is flushed to the sewer by suddenly opening the valve. As I have already said, the grating must be on the bottom rather than on the side to allow of this being done.

In pools used by women, bathing suits are worn, usually colored ones, and the amount of fibre that comes off is vastly more than one would think, and it is most unsightly. I saw a device not very long since in Boston, designed to remove such material. It is best described as a modified carpet sweeper of the suction type, entirely similar to what is ordinarily used for cleaning floor rugs. The handle is about one and one-quarter inches in diameter, and of course it is hollow, and it is attached to a suction motor by a hose. There is a brush at the bottom and about 18 ins. long and 6 or 8 ins. wide, filled with stiff bristles set along a slot. Upon applying suction the material goes out through the handle and is discharged into the side gutter.

Although chlorination and filtration are the usual means employed for keeping the pool water in proper condition, there are two other ways of securing water improvement—ultra-violet light and ozone—which have been somewhat recently introduced. The University of Illinois formerly used

chlorination, but they are now using ultra-violet light, and they speak well of it. As a device it is certainly very attractive in appearance. It may be remembered that the Athletic Club at 59th St. and Sixth Ave., New York, uses it successfully, although with what charge for upkeep I cannot say. The Board of Health of New York City has pretty thoroughly threshed out the question of ozone and has reported favorably on it. The amount of money which is quoted in the Board of Health report is small enough, but the upkeep of an ozone plant is usually considerable. It is a fragile thing. And so is the ultra-violet light outfit a fragile thing. We have one in Troy, used for other purposes, and we have found it to be pretty fragile in our experience.

At Rensselaer we attempt to keep our alum dose about one grain per gallon, but, of course, we do not hope to strike that amount accurately, as we employ self-feeders. It is not as though we had a large plant where we could run in a well-controlled alum solution.

So far as chlorination is concerned, we use a very homely, but we think an efficient, method of application; ordinary bleaching powder is mixed up with water into a cream and distributed directly by hand at the shallow of the pool. In dose we use "bleach" enough to correspond to .6 of a part per million of chlorine, which is the amount legally adopted in California. At Yale they use .3; Northwestern .6, the same as we do; and in some other instances the dose is as high as 1 part per million.

Objections to Dosing

We all realize that there is an immense amount of objection on the part of some bathers to the dosing of a pool. We have had complaint time after time, and it is usually based upon imagination. A bather cannot detect the presence of .6 of a part of chlorine per million. In practical tests we found that there was a suggestion of smell at 1½ parts chlorine per million, but no taste and no action on the eyes whatever. At 2½ parts per million of chlorine there was a faint smell, but there was no taste and there was no action on the eyes. When we ran up to 50 parts per million, of course we got a strong taste and we also got a strong smell, but did not notice any action on the eyes. The bathers have complained of dosing when no dose had been used. I remember that years ago when we were about to turn on the alum at the new filter plant at Elmira, the people tasted the alum four days before we put it in.

With reference to establishing a legal standard for the water of swimming pools, I know of only two states that have made the attempt, California and Florida. California has a pretty liberal standard. They attempt to keep the total count of bacteria below 1,000. At Rensselaer we do better than that. It may be rather more good luck than good management, but we have been running on an average of about 250.

So far as the presence of coli is concerned, we rarely get coli, as our .6 of a part per million of chlorine every week seems to control their growth. California allows one bacillus coli communis per cubic centimeter.

The preliminary showers should not be too cold and the soap used should be liquid. Many people dread a cold shower although they do not object to a cool plunge, consequently, unless arrangements are made to take the chill off the shower water, the actual washing accomplished by it will be rather sketchy.

Treatment With Copper Sulphate

Pools that are built in the open without protection from direct sunlight, will probably be troubled with growths of algæ, especially if they be filled with ground water. Copper sulphate is the natural remedy in such a case and the amount required, which is very minute, is best determined by trial. Considerable stress is sometimes laid upon the advantages of direct sunlight in those unusual cases of such indoor pools as possess it, but the gain is offset, at least in part, by liability to algal growths. In such instances copper sulphate is again useful, but the need for complicated apparatus to administer the dose is unnecessary. Plants supplied with such dosing outfits seldom or never employ them.

(Concluded on page 467)