

more vegetation than all other animals, including mankind, do; yet such is undoubtedly the case; and man finds that although he can cope with any of these insects individually, their vast numbers render them formidable enough to often render famine imminent.

But if we remember that not one of these races of insects exists which is not food for some other insect, bird, or animal, we have the clew to the remedy for their ravages. Keep the power of the eaters and the eaten properly balanced, and their mischief will cease to terrify.

SARATOGA SPRINGS.

This popular summer resort seems to have lost none of its prestige, judging from the crowds of people who have visited it during the present season. Its hotels are filled, its numerous springs still flow abundantly, and their waters are eagerly sought for by those who are sick, or imagine themselves so, and those who, being well, desire to remain so.

In our recent visit to this watering-place, although we must confess its attractions are many, and its hotels conducted in model style, we were led to entertain some doubts as to whether more benefit than harm is derived from the profuse and indiscriminate drinking of the water by visitors who are accustomed to hear of the generous rivalry that goes on respecting the virtues of the various springs. The celebrated Congress Spring, though declared to be weak in comparison to former years, still maintains its supremacy, and this famous water can be purchased in London, Paris, Calcutta, and Hong Kong. The Empire Spring sends forth a clear, delicious, and healing water, superior in its medicinal effects upon some diseases to the Congress. The new "Hathorn" is a fine spring, recently discovered, and is already very popular. Since the last year this water has cleared up, and no longer irritates the intestines of its habitual drinkers. The "High Rock," the "Star," and the "Excelsior" are also excellent springs, and deserve to be noticed favorably.

But the greatest natural curiosity among them is what is called the "Geyser" Spring, discovered last winter by the proprietor of a bolt factory directly underneath the center of the building. Noticing traces of mineral water at this point, he caused a boring to be made to the depth of 150 feet, where he struck water in a stratum of bird's-eye limestone. This remarkable stream spouts intermittently but rapidly to a height of twenty feet into the building which has been transformed into a bottling establishment.

An analysis by Professor Chandler shows this water to be particularly rich in mineral ingredients. It contains chloride of sodium, chloride of potassium, bromide of sodium, iodide of sodium, fluoride of calcium, bicarbonate of lithia, bicarbonate of soda, bicarbonate of magnesia, bicarbonate of lime, bicarbonate of strontia, bicarbonate of baryta, bicarbonate of iron, and sulphate of potassa, with traces of phosphate of soda, biborate of soda, alumina, and silica. The water is agreeable to the taste of those who like it. It is a powerful cathartic in its action, and the spring is considered one of the best ever discovered. It takes a long time, however, to obtain a widely extended popularity for any of these springs; hence the waters are always freely given to those who will come for them. Yet, although the waters are free to all comers, he that hath no money, though invited to come, will find no rooms at Saratoga. The hotels are crammed with visitors, and private houses are called into requisition to hold such as the hotels cannot accommodate, the prices visitors are willing to pay being such as to tempt people in moderate circumstances to accept the inconvenience for the sake of gain.

But to go back to the use of the waters by old and young, sick and well, alike. At the mineral springs in various parts of Europe the waters are generally taken under the direction of physicians. In this country few of the frequenters of such places act under advice, but proceed to swill down the waters of first one spring and then of another without regard to quantity or quality or adaptability to their physical condition, apparently going it blind in the hope of being benefited before they get away.

Now this is entirely wrong, these waters are strong solutions of mineral salts, of greater or less therapeutic power, and it is just as rash and senseless to drink them in this manner, as it would be to rush into an apothecary's shop and, shunning all the violently active poisons, to go the rounds of his bottles and jars, taking a sip from one and a pinch from another, without regard to their probable effect.

An instance in point occurred while we were at Saratoga this season. An old gentleman, afflicted with a heart disease, drank in rapid succession some ten or a dozen glasses of the "Washington" spring water, the tonic power of which is well known. His circulation was so accelerated thereby that his heart could not endure the increase of labor demanded, and he fell dead upon the piazza of the hotel.

We have no doubt that, while these waters are of immense value, as remedies for general debility, and various forms of disease, many are injured rather than benefited by their use, simply because they use them without proper discrimination, which can only be obtained through competent medical advice.

NINETY DEGREES IN THE SHADE.

The above expression, with the numeral adjective changed according to circumstances, is very commonly met with, and yet as giving anything but an approximate index to the real temperature of the air it is of little value.

The indefinite character of the phrase creeps in at the last word. Ask almost anybody what they mean by "in the shade," and they will tell you "out of the sunshine."

Now in two different places in this office the thermometer will often vary by a number of degrees when both are out of

the sunshine. This variation cannot certainly be attributed to differences in the temperature of the air at the points where the thermometers hang, since there is free and rapid circulation throughout the entire building. Directly opposite the room where the writer now sits is a large brick building, against which the sun shines during the afternoon. The radiation of heat from this building is such that the thermometer will sometimes stand several degrees higher with the shades raised than with them down.

It is evident, therefore, that if the exact temperature of the air be sought, it is not enough to place a thermometer out of the sun. It should be placed in a total heat shadow where it may be read by reflected or diffused light, but be protected, as nearly as may be, from the effect of all heat except that of the air itself.

A common error in regard to thermometers may be mentioned here. It is thought by many that when air is blown over the bulb of a thermometer it will indicate a lower temperature. This notion grows out of the fact that the body feels cooler in a breeze than in still air. The latter result is due solely to the facts that the power of air to convey heat from a body hotter than itself is increased by free circulation, and that evaporation, the great cooler, is also greatly promoted thereby. Neither of these facts apply to the thermometer, since the mercury in the bulb of that instrument, if properly placed, is of the same temperature as the air, and no evaporation, under ordinary circumstances, takes place therefrom. But wet the bulb with water even a degree or two higher in temperature than the mercury; the result will be that after an instant or so the mercury will commence falling, and will mark a lower temperature than that of the air in which it stands. The effect will be still more remarkable if ammonia or ether be used instead of water.

This experiment illustrates the effect of wind upon the thermometer when the bulb is wet. But when the bulb is dry, a precisely reverse effect is produced, although much less in degree. Tyndall shows, in his lectures on heat, that the friction of even the gentlest zephyr upon a fixed body generates a perceptible amount of heat therein. Therefore if air at rest causes a given expansion in the mercury column, when in motion it will cause an increased expansion from the heat generated by friction. Of course this increase is very small. In fact it is less than can be perceived upon the column itself, and can only be determined by the most refined methods. The fact remains, however, that if there be more it cannot be less, which is sufficient for our present purpose.

When we hear of the thermometer standing at one hundred in the shade at any point north of Philadelphia we are always inclined to doubt that the indication is a fair exponent of the temperature for anything more than the immediate vicinity of the instrument. We very much doubt that in any locality on the continent north of the fortieth parallel the thermometer ever indicated one hundred degrees in open air when shielded not only from the sun's rays but from the radiation of surrounding bodies.

THE ACTION OF WATER ON LEAD, TIN, AND COPPER.

Mr. Paul Casamajor, an accomplished chemist in the sugar refinery of Messrs. Havemeyer & Co., has been making some original experiments upon this vexed question which we find published in the *American Chemist*, and the importance of the subject leads us to make an abstract of the results of his researches. The presence of lead in Croton water, after standing in the lead pipes for the night, has been incontestably shown by Professor Chandler. Mr. Casamajor also proves that it is often present in the tin-lined boilers, and accounts for its presence there by the voltaic action resulting from the contact of the lead in the lining, or in the connecting pipes with the copper of the boiler. To prove this he took pieces of lead and copper and put them in contact in two flasks which he left in the dark at the temperatures of 75° Fah. and 150° Fah., for forty hours. In both instances the surface of the lead was corroded, and that metal was found to be in solution in the water. It therefore becomes a serious question what influence the imperfect lining of boilers may exert. It is essential that so much lead is used in their construction, instead of block tin, that every one of them is a galvanic battery, producing more or less lead poisoning. This fact has been overlooked, and while many families have taken the precaution to remove all lead pipes, they have forgotten to inquire into the composition of the kitchen boiler. On this point Mr. Casamajor remarks: "These results leave no doubt on the hurtful effect of exposing drinking water to the simultaneous action of both lead and copper. The effect of an untinned copper boiler must be felt on the cold water as well as on the hot, as all the lead pipes are in communication with the copper boilers by metallic conductors. Whether an untinned copper boiler may not even have an injurious effect on the water of a neighboring house is an inquiry before which we must pause."

The next point to be examined was how far lead and tin react upon each other when placed in contact in water at 75° and 150° Fah. To ascertain this he instituted experiments similar to those previously described.

"At the end of twenty-four hours the flasks were examined and replaced in the dark. The lead in contact with tin was slightly tarnished, while that of the other flask (tin in water alone) remained perfectly bright. At the end of six days the tarnish of the lead in contact with tin persisted, but did not seem to have increased. This is apparently due to this circumstance, that a voltaic couple of tin and lead in aqueduct water is very weak, tin being slightly more positive than lead. Under the influence of the weak current at first produced, the lead, being more electro-negative, becomes slightly

oxidized, until the coat of oxide presents such a resistance to further action that the two metals are put on a par, and no current is afterwards produced. The lead of the other flask, which had now been in water for over a week, was as bright as when first put in the water." Mr. Casamajor was unable to detect the least trace of lead in the flask where the lead or tin had been left in contact. And his experiments would seem to throw great doubts upon the assertions frequently made that tin and lead mutually act upon each other and poison the water. A great objection to tin-lined lead pipe and tin-lined lead pipe has been that in places where there was a fracture or where the surfaces came in contact under water a voltaic current was produced and some of the lead was carried into solution. Mr. Casamajor's experiments do not confirm this theory, but, on the contrary, he could find no lead whatever, although he put the metals in the most favorable conditions for accomplishing the reaction, if any could be expected. Lead and copper in contact under water at once react upon each other, but lead and tin appear to be neutral after the formation of the first coating. It would be gratifying to have these experiments confirmed, as a good deal of disquieting doubt has been cast upon the security that was supposed to be offered by the tin-lined and tin-lined lead pipe. In reference to the danger of leaving water in contact with lead alone there appears to be no doubt in the mind of any person. And this danger is greatly increased by the presence of nitrates and chlorides in the water. Lead is a subtle poison, and too much care cannot be taken to prevent its presence in water that is required for domestic use.

THE USES OF SOLUBLE GLASS.

Although liquid quartz, or soluble glass has been known for more than fifty years it does not, even at the present day, have half the applications in the arts of which it is capable. It was accidentally discovered by Prof. Fuchs, of Munich, while engaged in searching for a method by which to prepare pure silicic acid, and was afterwards very thoroughly studied by him, and all of its properties made known.

It is a very simple thing to make either in the dry or the wet way, and the choice of the methods depends upon the quantity to be prepared. Pulverized flint stones or quartz pebbles, or fine sand, can be dissolved in a solution of caustic soda or potash, when boiled under a pressure of 7 or 8 atmospheres. Infusorial earth or Tripoli is also admirably adapted for this purpose. In the dry way it is usual to fuse 45 pounds of quartz, 30 pounds of potash, and 3 pounds of charcoal powder; or 45 pounds of quartz, 23 pounds of calcined soda, and 3 pounds of charcoal.

For certain purposes it is also customary to make a glass of soda and potash combined. This mass fuses easily, and is readily soluble in hot water. As the solution absorbs carbonic acid from the air it must be kept well sealed.

Soluble glass is sold in liquid form of a given strength, usually 33 degrees, meaning 67 parts of water and 33 parts of the dry powder. When required for use it is necessary to dilute it, as the above concentration is too strong for most purposes.

There was at one time a proposition to boil gold quartz in the alkali of the West, and thus to bring it into solution by which the metal would settle and the liquid quartz could be converted into building stone or employed for any other purpose for which it is adapted. The quantities to be dealt with—the great amounts of soda required for the operation—appear to have stood in the way of the practical application of this method, but theoretically it was perfectly feasible.

It would not be easy to detail all of the uses to which soluble glass has been applied, but it may not be out of place to recapitulate some of them: To protect wood from the action of water, air, and fire; in fresco paintings on walls; to repair stone buildings; to make artificial stone; for cementing broken glass; to make hydraulic cement; to protect metals from rust; as a solvent for corallin; to mix with mineral colors; as a solvent for various substances; as a lubricator; to preserve the elasticity of leather bands on machinery; for painting on paper hangings and calicoes; to give glass the appearance of enamel; as a detergent; as a reagent in the laboratory; to impregnate petroleum barrels, beer casks, butter tubs, and milk pails, so as to render them tight; for glazing clay pots as a substitute for lead; and the manufacture of artificial gems. Its chief value is in the restoration of stone buildings, in fresco painting, and to render fabrics un-inflammable. As a means of preserving iron from rust, and as an external application to wooden buildings, it has been attended with so many failures as to throw doubt upon its practical value for these purposes. Its usefulness on leather belting we also deem extremely doubtful, although it has been recently asserted to keep such belts soft. It is an article that ought to be manufactured on a large scale and more generally used.

WHO DISCOVERED NITRO-GLYCERIN.

It is somewhat remarkable that the date of the discovery of nitro-glycerin should be a matter of dispute after all that has been published on the subject. The honor is sometimes ascribed to Professor Williamson (1853), and again to M. Nobel, the Swedish engineer who has done so much towards making its properties known; and to the late Professor Pelouze is also given the credit. In the transactions of the Turin Academy of Sciences for July 5, 1847, may be found a memoir on fulminates, and the action of nitric acid on certain organic compounds, by Professor A. Sobrero. In this paper the author gives an account of long and dangerous researches made by him on this subject.

He states how he prepared nitro-glycerin, mentions the properties of the new compound, and gives its principal re-