ZINC IN DRINKING WATER.

By F. P. Venable, Ph. D.

The increase in the use of galvanized iron, especially in the form of water tanks and pipes, has lead to a reopening of the question as to the possible injurious effects from the use of such water. It is a matter of importance then to us how far our knowledge extends on this subject, and I will collect here all of the known facts so far as I have been able to get at them.

The so-called galvanized iron is of course nothing more than iron dipped in a bath of zinc and so superficially coated with it and to a certain extent alloyed with it. The character of the protection afforded the iron is galvanic (hence the name), the two metals forming a galvanic couple, so that under the action of any exciting liquid, the zinc and not the iron is attacked. That zinc dissolves in potable waters has long since been shown by the experiments of Boutigny, Schaueffele and Langonné. Distilled water and rain water dissolve it more readily than hard water. Especially is water containing carbonic acid capable of this solvent action. So much may be taken up that the water becomes opalescent and acquires a distinctly metallic taste. It seems that by the action of water, hydrate and carbonate of zinc are gradually formed, and that this action is more rapid in the presence of certain saline matters, but is weakened by the presence of calcium salts.

As to the injurious effect of such waters, authorities differ. Fonssagrives has investigated the question, consulting the statistics of the French Navy and the recorded experiments of others, adding, however, none of his own. The French Government had, before this, appointed a committee to make a special report on the subject, and the investigations of Roux in 1865 and 1866, furnished evidence enough of possible injury to health from water stored in galvanized iron tanks to lead to an order, from the Minister of Marine, prohibiting the use of such tanks on board of ships of war. Boutigny attributed grave effects to the use of these zinc-containing waters, looking upon it as probably resulting in epilepsy. Fonssagrives, however, maintains that the zinc is not cumulative and produces no bad effects unless taken in large doses. Doubt is thrown on this position, however, by the fact that his assertions as to the limited solubility of zinc in ordinary drinking water are not sustained by experiments. Without doubt such waters have been used for con-

siderable lengths of time and no injurious effects have been noticed. This may have been due, however, to the hardness of the water, and hence the small amount of zinc dissolved. Pappenheim states in contradiction to the assertion of Fonssagrives that zinc vessels are dangerous and must be carefully avoided. Dr. Osborne, of Bitterne, has frequently observed injurious effects from the use of waters impregnated with zinc. Dr. Stevenson[1] has noticed the solvent action of rain water on galvanized iron and states that probably its continued use would cause injury to health. He recommends as a convenient test for the presence of zinc in potable waters, the addition of potassium ferocyanide to the filtered and acidulated water. Zinc gives a faint white cloud or a heavier precipitate when more is present. Dr. Frankland[2] mentions a case of zinc poisoning where well-water, containing much dissolved oxygen and but little carbonic acid, was used after passing through galvanized iron pipes. Prof. Heaton[3] has recorded the analysis of a spring water in Wales, and a second analysis of the same water after passing through half a mile of galvanized iron pipe, showing that the water had taken up 6.41 grains of zinc carbonate per gallon.

A similar instance of zinc-impregnated water has come under my own observation, and I append the analytical results. The water from a spring 200 yards distant was brought by galvanized iron pipes to a dwelling house and there stored in a zinc lined tank which was painted with white lead. The water became somewhat turbid and metallic-tasting and its use for drinking purposes was discontinued. Analyses were made after the pipes had been in use about one year. A somewhat full analysis of the spring water was made under my direction by Mr. J. C. Roberts. The analyses of water from the tank and directly from the pipe, I carried out only so far as zinc, iron, and tests for lead were concerned. The results are calculated in grains per gallon of 231 cu. in.:

ANALYSIS OF SPRING.

Silica	2.45	grains.
Lime	.23	"
Magnesia	.17	"
Alkalies	.43	"
Chlorine	.35	"
Sulphuric acid	.19	"
Carbon dioxide (calculated)	.45	
Total residue on evaporation	4.34	

1. Chem. News, 49, 107.
2. Chem. News, 49, 115.
3. Chem. News, 49, 85.

The tank contained 4.48 grains of zinc carbonate per gallon with a trace of iron and no lead. Water from the pipe gave 4.29 grains of zinc carbonate per gallon and a trace of iron.

It is evident then, when the dangerous nature of zinc as a poison is taken into consideration, that the use of zinc-coated vessels in connection with water or any food-liquid should be avoided.

Chemical Laboratory, University of N. C.

SOME COTTON-SEED ANALYSES.

By E. A. DeSchweinitz.

The interest attaching to the variation in the percentage of fats yielded by different varieties of cotton-seed, has led to the analysis of several American and foreign seeds, with results as tabulated.

Table I. gives a food stuff analysis of the kernel, and table II. the value of the raw seed as to its ash, and possible yield of fats.

In all cases the fats were extracted with ether, the proteins calculated from the percentage of nitrogen, the fat-free residue was washed with NaHO and $H_2 SO_4$ to find the crude cellulose and the carbohydrates obtained by difference. The calculations are all made on the air-dried seed. Eight varieties in all were examined.

No. 1. Belongs to the botanical species Gossypium hirsutum; generally supposed to be a variety of the Gossypium Barbadense. It is called the "Duncan" cotton, comes from the eastern part of the State, was grown on sandy land with a yield of 400 pounds to the acre.

No. 2. Also Gossypium hirsutum, known as the "Heavy Boll Prolific," was grown on sandy loam in the central part of the State with a yield of 300 pounds to the acre.

No. 3. Gossypium hirsutum, known as "Sea Island" cotton grown for one year on clayey loam in the central part of the State with a fair yield.

No. 4. Is known as the "Hodge" cotton, was grown on sandy upland with a yield of between 300 and 400 pounds to the acre.

No. 5. Known as the "American Cotton Tree," is a variety not cultivated for commercial purposes but grows wild on marsh land in warm districts. The seed shows a noticeably high percentage of ash