name and in effect, and he should have all the functions of a general manager of a private corporation.

*A Great Past—A Greater Future.* Now I do not want to be misunderstood in making these criticisms. I do not want any reader to get the notion that I think the A. Ph. A. is all wrong. On the contrary, the A. Ph. A. is the one great catholic organization in American pharmacy—the one organization acting like a parent to all the others—representing every phase and branch of the calling, and doing foundational work of an indispensable character. It is an association with a great past. It is an association with a still greater future. My only point is that it has outgrown the clothes of a growing youth and now needs the equipment of the adult it has come to be. Particularly are the annual meetings in need of reform if they are successfully, intelligently, and efficiently to handle the vast amount of work undertaken by the association.—*The Bulletin of Pharmacy.*

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## SYRUP OF FERROUS IODIDE.

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There are few preparations in the Pharmacopœia that have given more annoyance and caused more difficulties to the pharmacist than the syrup of iodide of iron. The literature on this syrup, from the first day of its appearance, is very voluminous and hundreds of writers on pharmaceutical subjects in all civilized countries have recommended various methods for its preparation and given direction for its preservation. The history of this syrup, as shown in the various editions of our own Pharmacopœia, demonstrates the gradual development of its understanding.

A liquid preparation of ferrous iodide appears first in the second edition of the U. S. P. (1840) under the name of Liquor Ferri Iodidi. It was made of iron wire and iodine and contained 5 fluidounces of honey in a finished product of 20 fluidounces. In the following edition, the third (1850), the honey was replaced by 12 ounces of sugar, but the preparation was still called a solution. The name syrup appears for the first time in the fourth edition (1860). The formula directs the addition of two troy ounces of iodine to a mixture of 300 grains of iron wire and water, and filtration of the resulting green liquid into simple syrup heated to 212° F. The syrup is to be preserved in well-stoppered two-ounce bottles. Here we see that the value of applying heat is recognized. No change in the formula was made in the fifth edition (1870). In the sixth revision (1880), of the Pharmacopœia, which shows throughout many marked improvements over the preceding ones, weights were replaced by parts and the finished product brought to 1000 parts, which designation afterwards gave way to cubic centimeters. Syrup of ferrous iodide is here described as a syrupy liquid containing 10 percent of ferrous iodide. It is made from 25 parts of iron and 82 parts of iodine. The liquor is filtered into 600 parts of sugar and the

syrup heated to the boiling point, before putting it into small, completely filled and well-stoppered bottles. It is to be kept exposed to daylight. In the seventh revision the iodine is increased to 83 parts and the liquor filtered through a funnel, the lower end of which dips below the surface of the sugar in order to prevent contact with the air. The instructions as to daylight were omitted. Here, too, we find for the first time directions for testing the syrup. In the eighth edition more changes were made. The percentage of ferrous iodide was reduced from ten to five, and two percent of hypophosphorous acid added as a preservative. Fifty grams of sugar are at once added to the aqueous boiling solution of ferrous iodide, before filtering it into the remainder of the sugar, which is to be dissolved by heat. No directions are given as to keeping the finished product.

The history of this syrup in the United States Pharmacopœia, as well as that of all other pharmacopœias, reveals the difficulties that are encountered in its preparation and the various methods employed to overcome them.

No matter how carefully the original ingredients—iron, iodine, water—are selected and tested as to their purity, the reaction between them will not always proceed alike. The pharmacopœias of all nations take notice of this peculiarity. They direct the addition of cold water to check the reaction, and gentle heating to promote the reaction, if necessary. It has never been explained why this different behavior in so simple a preparation should exist. In similar chemical processes a remedy for too violent reaction is sometimes found in the use of a catalyzer and some experiments made in this direction with the solution of ferrous iodide seem to indicate that it could be used here to advantage. I have tried a coil of clear, bright iron wire put in a porcelain dish with the chemicals to be of great service, the reaction proceeding gently and steadily so that neither heat nor cold water were needed. Dr. P. Bohrisch, of Dresden, in a recent article on this subject, recommends the use of a bright iron spatula to be held in the solution during the reaction.

That the stability of the syrup is increased by heating, was soon recognized. Hager, in his handbook, recommended it long before the pharmacopœias adopted it. Hager's idea was that the heat would invert some of the sugar, and that invert sugar was more stable than ordinary sugar. Following this suggestion O. Linde recommended the use of invert sugar, and Scheling claimed that glucose was still better. This last claim was explained by others as owing to the small amount of sulphurous acid always present in glucose. This again led to the addition of sulphurous acid in the form of sodium bisulphite. A number of other preservatives were also tried. Constatin-Tamasici, a noted French pharmacist, recommended the addition of six drops of lactic acid to one litre, while others preferred tartaric acid. Hausmann recommended hypophosphorous acid, a suggestion that had been made before by J. F. Judge in the American Journal of Pharmacy in 1876. The addition of 5 percent of pure alcohol is also mentioned in French journals as a good means of preserving the syrup. The latest chemical to be recommended is citric acid. Extensive experiments were made with it and at present three pharmacopœias, the Swiss, the Austrian and the Belgian, direct citric acid to be added in quantities of 0.5 to 1 percent.

Besides the preservatives the mode of keeping the finished syrup was carefully examined. Here also the investigators arrived at different results. Some recommended dark bottles, others light ones; some kept their product in dark closets, others exposed it to direct sunlight, and again others to diffused light. The directions in successive editions of nearly every pharmacopœia sufficiently show the tendency of the respective time and the changes that took place in the minds of the revisors.

In all these efforts to find the proper preservative for the syrup of iodide of iron the object in view was the preservation of color and taste of the syrup when kept on the shelves of the shops. But this is not sufficient, as has often been pointed out. If a physician orders two ounces of the syrup to be taken three times a day in doses of ten drops, there are about 100 doses in the bottle and the medicine will last longer than a month, during which time the color will often change. Every dispenser has had the experience that a customer will return with a bottle containing this syrup and ask if the changed color is an indication of deterioration. Our efforts should therefore be directed to prepare a syrup of iodide of iron that will keep not only on the shelves of the shop, but also in the hands of the patient when the bottle is opened several times a day.

Recognizing the difficulties of preparing and preserving this syrup the manufacturers of pharmaceuticals have tried to relieve the pharmacists of this care (!) by preparing a concentrated solution of the iodide of iron, from which the syrup of ferrous iodide is made by admixture with simple syrup. The remedy would be a good one provided a solution can be made that will keep. Experience, however, shows that these solutions, after opening the containers a few times, are subject to the same discoloration as the syrup.

When I was entrusted with the chairmanship of the sub-committee on syrups and elixirs for the 9th revision of our Pharmacopœia I commenced a series of experiments with a number of syrups, among others the syrup of ferrous iodide. More than sixty samples of the latter were examined. Some were bought from reputable druggists, some from manufacturers, some were made from solutions, but the majority were prepared according to the formulæ of various pharmacopœias. Every method known was employed. Granulated sugar, lump sugar, invert sugar and glucose were tried; also filtering the solution cold and hot into sugar or syrup. Heating the solution and heating the finished product was resorted to. All the recommended preservatives were tried. Some bottles were opened 3 times a day for a month and 5 to 10 drops taken out. Tests were made for free iodine, at the beginning of the work, after 3 months and after 6 months. The amount of ferrous iodide present was determined by the silver nitrate method of the Pharmacopœia. All observations were carefully noted.

The results of this long series of observations are as follows:

The presence of a catalyzer during the preparation of the solution is desirable. A coil of bright iron wire or a bright iron spatula may be used.

The solution should be brought to the boiling point and the sugar dissolved in it at once by the aid of heat.

It is immaterial whether the finished syrup is again boiled or not.

The finished syrup should be kept in small, well stoppered, completely filled bottles in ordinary daylight. The color of the glass is immaterial.

Neither invert sugar nor glucose are preferable to granulated sugar.

Syrup of iodide of iron made from the best ingredients does not need any preservative to remain perfect on the shelves of the shop. The samples with hypophosphorous acid kept equally well as those without it; but its addition is neither an advantage nor a necessity.

After dispensing, or when the bottles are opened several times a day, citric acid is the best preservative; but its power seems to be restricted to a limited time, after which discoloration takes place very rapidly.

When the pale green color of the syrup has changed to lemon yellow or light brown, the loss of ferrous iodide is very small, ranging from one-fourth to three-fourths of one percent of the required quantity.

On the strength of these results the conclusion may be drawn that syrup of iodide of iron, when prepared from pure chemicals, does not need any preservative. When dispensed in bottles that will be opened several times a day, the addition of one-half of one percent of citric acid is advisable, provided the prescribed quantity will be consumed within thirty days. A slight change of the color during the prescribed time of taking it is negligible.

## ASH CONTENT OF CRUDE DRUGS.

E. L. MAINES, PHAR. D.

Ash standards of crude drugs have been given more consideration of late years than formerly and are now included in the United States Pharmacopœia and the more widely known foreign pharmacopœias. Ash limitations were first introduced in the second edition of the German Pharmacopœia, published in 1882 and in the United States Pharmacopœia of 1880.

On account of the difficulty in securing reliable data on these ash standards, an investigation was begun in our laboratory with the object of securing suitable standards and ascertaining the actual variation in ash content of the various drugs.

These determinations were made upon the commercial air dried drugs after having been reduced to a fine powder (No. 60 if possible) and the sample incinerated until the residue was free from carbon, employing such means as to insure perfect combustion. The sample was placed in a tared porcelain crucible and at first, heated gently in a Bunsen flame, the temperature being gradually increased, or a blast lamp employed, until the residue ash contained no unconsumed carbon.

The ash standards as set by the various pharmacopœias are not all that could be desired. Most striking variations may be seen in ash standards for the same drug in different pharmacopœias as was clearly shown in a paper by M. I. Wilbert (Jour. A. Ph. A., May, 1912) and in which he gives a table of ash limitations for the recently published pharmacopœias.

The importance of ash examinations in determining the quality of crude drugs should not be overlooked as they form one of the best tests as to quality, uniformity, etc.

The Report of the Committee on Drug Market for 1913 contains ash determinations for nearly all of the crude drugs reported.