Here also the U. S. P. VIII simply considered ether-soluble alkaloids and the U. S. P. IX only total alkaloids. All these facts seem to show that the requirements of the new Pharmacopoeia are lower than those of the old. For example, a fluidextract of cinchona according to U. S. P. IX may pass with 4 Gm. total alkaloids in 100 mils while the U. S. P. VIII required at least 4% ether-soluble alkaloids.

In the opinion of the author it would be much better to have requirements for both total and ether-soluble alkaloids for Cinchona and its preparations. Quinine is, of course, the most important and active alkaloid present and the ether-soluble alkaloidal factor is a fairly good check on the percentage of quinine present. Especially, at present, when such a large variety of cinchona barks are being placed on the market, a close check on the quality should be kept.

RESEARCH AND THE UNITED STATES PHARMACOPOEIA.*

BY A. H. CLARK.

The question of Pharmacopoeial Revision is now a very live one. Much has been published within the past year regarding the present plan of revision. Many suggestions have also been made as to changes which might lead to an improvement in the present arrangements. In this paper only one phase of this important subject is discussed—research in connection with the scientific problems involved. Only by thorough and accurate research can any of the objectionable features of the present scientific work of the Pharmacopoeia be overcome.

When I became a member of the present Committee I was a stranger to revision methods, and also somewhat younger and much less experienced. Both of these factors operated to give me abundant enthusiasm. I immediately set out to demonstrate by a thorough investigation of the literature the correctness of all statements made in the Book and, if necessary, confirm them by experiments conducted by myself or under my directions. Alas! Before proceeding very far along this path I was hopelessly lost in the wilderness. Some of the statements made did not seem to have any source in the literature. Effort was then made to demonstrate by actual experiment whether or not these statements were true. Again, disappointment! In some cases the experiments led so far into the maze of scientific thought that I was completely lost. Other statements, while involving apparently simple question of theory, were found to be so complicated in fact that experiments undertaken to decide them seemed to involve work without end. Finally nearly all of my dreams vanished in the mists of reality, for it was found to be physically impossible to accomplish even a small portion of the things I had hoped to do. It is not unlikely that others have had the same dreams and disappointments.

The instructions for the last revision were to change only those things that had been criticized or about which something new had been published. In other words, to base all revision upon published criticisms and to attempt no extended investigations. This has been the policy to a greater or less extent from the very beginning. It has resulted, I am sure, in some statements being handed down

* Read before Scientific Section, A. Ph. A., Chicago meeting, 1918. According to notes of the reporter there was no discussion of the paper.—Editor.

from year to year without proper verification and also in the too hasty adoption of others. Some statements seem to me to be quite useless or unimportant. No doubt some very important things have been omitted for various reasons. Finally some of the inclusions could no doubt be improved by careful study. Research should be the final judge of these questions. A few examples, that will serve as illustrations, follow:

The Pharmacopoeia states that "glycerin when of a strength between seventy and one hundred percent rapidly volatilizes at 100° C." This statement was submitted to a student of our Pharmaceutical Chemist Course and he reported that he could not trace its origin. After a number of experiments he also concluded that it was not a fact. He spent some hours on this little problem and I am not sure that he threw much light on it.

The Pharmacopoeia states that boric acid "is converted into metaboric acid when heated to 100° C. and then slowly volatilizes at that temperature." Several hours were spent trying to verify this, but finally the experiments were abandoned because so many factors were involved which complicated the work.

These two statements seem to me to be of little or no importance, yet if they are to be included they should be true to fact. If carefully conducted research throws any doubt upon them they surely should be omitted.

As examples of those things which are important and seem to need revision attention might be called to the directions for the titration of nitric acid with methyl orange; the test for chlorination products in benzaldehyde; the titration of phosphoric acid, and the test for methyl alcohol in ethyl alcohol. Some of our students have been working on these problems, and although we have spent many hours on them I am yet far from satisfied with the result of our labors.

Instances of pharmacopoeial descriptions that lack completeness may be matters of opinion, but I have had some students working on a few such problems for many hours with relatively insignificant results.

All of this indicates the necessity for more research in connection with pharmacopoeial revision problems, and gives an idea of the immense amount of time and labor involved in its support. It brings us to the question of how these things can be done. First of all, what agencies shall be selected to conduct such researches?

THE AGENCIES TO BE EMPLOYED.

As to this question there will no doubt be a wide diversity of opinion. Some of the following seem to be available:

The United States Pharmacopoeial Convention.
The United States Government.
The American Pharmaceutical Association.
The American Medical Association.
The American Chemical Society.
The Association of Official Agricultural Chemists.
The Universities.
The Colleges of Pharmacy.
The Medical Colleges.
Research Laboratories of Manufacturers.
Privately Owned Research Laboratories.

These are mentioned, and more could be added. The very important question is, the means to be employed for carrying on such researches.

THE MEANS OF CONDUCTING RESEARCHES FOR PHARMACOPOEIAL REVISION.

The very first thing to consider in this connection is funds. To my mind this work can never be carried on successfully without the liberal expenditure of money in the form of compensation to those who do the work, for the necessary supplies, equipment and other expenses. No one will deny that the best talent of the country has contributed to the present revision. The men doing the work have given freely of their time, and even money, and have accomplished much. I am sure, however, that they are all similarly situated in that their income for the present, and the future as well, depends entirely upon their activities in other fields. Under such conditions no one can expect these men to give their time to such investigations, as heretofore indicated, without proper compensation. The honorariums distributed, or the salaries that have been paid, are no incentive to diligent work when they are given to men whose time is worth ten or a hundred times such amount. These men will, and with perfect justification, give their time to the work which brings them the fixed income; what little remains will be devoted to revision problems. The only way, then, is to pay a small number of men salaries which will justify their devoting all of their time to work on the Pharmacopoeia. We can then look for thorough and competent research when the funds and men are provided, and there is some competent authority to furnish these.

REVISION AUTHORITIES.

There are few sources from which this authority for conduct of the Revision might come. In fact, of the agencies mentioned, only two seem to be available. These are the United States Pharmacopoeial Convention and the Government of the United States. The present Convention might assume this authority and elect a properly paid chairman, who would devote all of his time to the work and be the executive head of the Committee on Revision. The Convention might empower him to engage experts and appropriate sufficient funds for salaries that will secure their entire time. To these men, working together at some central point, all questions of a scientific nature could be submitted. They could test the accuracy of all statements made, determine their usefulness, test methods of assay, and the like. This would require considerable money, but this can be derived from the sale of the Pharmacopoeia, increasing the price if necessary. Legal and political questions, scope, editing, and the like, could all be handled by the General Committee.

Then there is the Government. It certainly has the money needed for such work. It also has abundant laboratory and library facilities. It would undoubtedly organize the work more quickly than any other force that could be employed for the purpose and, no doubt, do this with less expense than any other. It has the advantage of being a permanent organization and its efforts would thus be continuous. Its findings would also have the weight of authority and would, no doubt, remove some of the objections to the present connection between thePharmacopoeia and the Food and Drugs Act. It would have the authority to secure from other sources much information which no other body of men has. It could

also secure more coöperation from universities, colleges, scientific societies, manufacturers, and all Government departments, than any other organization. Authority to make final decisions and to promulgate them is much needed in cases such as this and the Government certainly has this authority.

I am quite sure that none of the other organizations mentioned would care to shoulder the financial obligations without adequate returns. The American Medical Association has a well equipped laboratory and for a number of years has been doing just the kind of work that should be done in connection with pharmacopoeial revision. The American Pharmaceutical Association is just entering the field. Its available fund for research is insignificant, however, and it remains to be seen what position it will occupy in this domain.

None of the other agencies mentioned could be expected to shoulder the burden. There are then really only two available agencies for the work, namely, the Government and the United States Pharmacopoeial Convention. Might not these two agencies, working together, be utilized to good advantage? I have always held that the purely scientific portions of the Pharmacopoeia: the technical descriptions of the drugs and chemicals, assay methods and the like, should be published in one volume; the information required by pharmacists and physicians in their daily work in another. The former could be made far more useful to the chemist, manufacturer, Government administrator and the like than the present book. The latter, containing such information as doses, solubilities, formulas for pharmaceutical preparations, etc., could also be made more satisfactory to the physician and pharmacist, I am sure. Might not the Committee of Revision prepare the one, and the Government the other? One could be made the physicians' and pharmacists' guide, the other a book of standards for those requiring it. I believe that all scientific questions, involved in preparing the Pharmacopoeia, would be solved by adopting this or a related plan. Then declare in 1920 the present Pharmacopoeia, with any changes that may be suggested by experience up to that time, as the tenth revision; proceed at once to prepare the eleventh revision, spending the entire ten years, if necessary, but have it ready for adoption promptly in 1930. Any serious defects discovered in the meantime could be corrected by authoritative bulletins. By following this plan, in a few decades a book would be evolved that would be so nearly perfect that the periodical discussion of ways and means for Pharmacopoeial Revision would find no place in print.

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BOTANICALS OF THE BLUE RIDGE.*

BY CLARE OLIN EWING AND ERNEST ELWOOD STANFORD.

The Bureau of Chemistry, in its activities in connection with the enforcement of the Food and Drugs Act, exercises supervision over crude drug products in general. While heretofore the greater volume and variety of foreign drug supplies has necessitated a more intensive study of these products, American medicinals have not been neglected. Owing to war conditions, American drug produc-

* A Contribution from the Pharmacognosy Laboratory, Bureau of Chemistry, Department of Agriculture, Washington, D. C.