sodium hydroxide solution is added to make alkaline, and the whole is diluted to 1000 cubic centimetres. The quantity of " phthalein " eliminated is determined, colorimetrically, by comparing the specimen collected, as above stated, with a standard solution of " phthalein " prepared by diluting 1 Cc. of " phthalein " solution containing 6 milligrammes to 1000 Cc. with water made alkaline. This comparison is most accurately made through the use of a colorimeter. The value of the test depends upon the following facts: 40 percent to 60 percent of " phthalein " injected is eliminated by the normal kidneys within one hour, irrespective of the quantity of urine excreted. If the amount of the substance eliminated is very low, 5 percent to 30 percent, then the kidneys are not functionating properly.

This diagnostic test of renal efficiency has attracted widespread interest, not only in this country, but in England, France, Germany, Japan, and Australia.

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PROGRESS IN THE CULTIVATION OF MEDICINAL PLANTS.*

BY HENRY KRAEMER, PH.D.

For the past fifteen years I have supported the theory that the cultivation of medicinal plants in the United States was not only practicable but essential for the scientific development of manufacturing pharmacy. As long ago as 1902 Doctor True wrote me as follows:

" This matter of the domestication and cultivation of our native drug plants is one that is interesting me a great deal and seems likely to take some of my time for the immediate future. I hope I may be able to trouble you often in connection with this attempt to open up a new line of agricultural work. I have no doubt that the right man will be able to get rich by cultivating drugs, if we can find methods of handling the articles so as to produce a first-class product."

During these years the work has been progressing very slowly and yet with very great satisfaction. Many students of botany have had their small gardens in which they grew a limited number of plants. I well recall that the late Professor John M. Maisch had a small garden in West Philadelphia, and so have others had these gardens. My first work was done in a side yard. In 1907, when the Foods and Drugs Laboratory of the Philadelphia College of Pharmacy was built, a lattice platform was laid on the top of the roof and we built a roof garden. We constructed our boxes, purchased about ten cart-loads of good soil, and went ahead planting trees, shrubs, and vines. We arranged beds with lattice for those plants that required shade. Out of an old zinc-lined trough we constructed a Jersey bog, in which iris, cat-tails, drosera, sarracenias were planted and bloomed. In the fall of 1909 the college erected a good green-house. During these years we have had under observation over 300 different species of plants. Most of these plants have been used in connection with investigations of crude drugs. In addition, the work has given us valuable data in regard to growing plants by means of seeds and cuttings, the drying and curing of them, and, in a few instances, of extracting their constituents.

It is not so much of my own experiments that I want to talk about to-night as it is the progress of the work done by others. I desire to refer to the splendid equipment of green-houses and grounds by Prof. E. L. Newcomb at the University of Minnesota. Professor Newcomb was associated with me when we

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began our work at the Philadelphia College of Pharmacy, and I look forward to the time when every college of pharmacy will have gardens of its own. I also desire to commend Professor Newcomb's attitude in making the products of the gardens useful to the pharmacists of his state. He is, as you know, supplying the crude drugs which he raises to the pharmacists, and I understand that there is a greater demand for them than he can supply.

In addition, several of our large manufacturing houses have drug farms and are harvesting crops on the same scale as the farmer. In our own vicinity, H. K. Mulford Company is growing on an extensive scale belladonna, digitalis, hydrastis, and cannabis, and is considering the growing of a large number of other medicinal plants. I will show you by means of lantern slides something of the work which is done by Burroughs, Wellcome & Co. at their farm which borders the little village of Darent, near Dartford, England; also the views of the farms of Eli Lilly & Co., near Indianapolis, Ind.

There is very great interest in the subject of cultivation of medicinal plants; unfortunately most of the inquiries we receive do not reveal genuine interest. They are usually from farmers who deplore the low prices they are receiving for their farm products, or from pharmacists who are dissatisfied with the profits of the drug business. To all such persons I feel rather conservative in encouraging them to take up this work, as it will require patient labor and incessant toil in order to secure any results. If one, however, has something of the pioneer instinct in him, and is capable of putting any product on the market, he ought to succeed.

Of course, one needs to have some practical experience in the growing of plants, but this can all be acquired through the practical courses at the state experimental stations, although nothing will take the place of actual practical work. In my new book on "Applied and Economic Botany" I have devoted a chapter to the "Cultivation of Medicinal Plants." This gives very valuable information for the beginner. Dr. W. W. Stockberger has given in a recent Farmers' Bulletin some interesting facts on drug plants under cultivation. The most comprehensive article on the literature of the cultivation of medicinal plants is given by Dr. Frederick Kilmer in his paper read before the National Association of Manufacturers of Medicinal Products, Waldorf-Astoria Hotel, New York City, February 8, 1915.

In conjunction with the large number of lantern slides there were shown between forty and fifty drug specimens which had been grown in the United States during the past summer. The principal reason for the engaging in the cultivation of medicinal plants is in order to establish a uniformity in the quality of vegetable drugs. Of course, improvements can be obtained, and the work already accomplished in this country justifies the prediction that, as in farm and economic products, the grower of drug plants can successfully meet these questions. The next year ought to witness a material increase both in the number of crops grown and their yield. If there are any agreements or treaties between the United States and foreign countries which would seem to restrict competition of drugs produced in this country with those imported, it is very desirable that everything be done to place the United States on an independent basis. The lesson of the past two years should cause us to seriously consider the necessity of protecting our own sick and not require them to pay exorbitant prices for the lack of supply of remedial agents.