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### PHARMACO-THERAPEUTIC INSTITUTIONS.\*

BY FRANCIS E. STEWART.

The great question before the American Pharmaceutical Association to-day is, how shall we promote progress in the science of pharmacology and the pharmacologic arts?

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What is meant by the science of pharmacology and the pharmacologic arts; and why is promotion of progress therein of unusual importance at this time?

The science of pharmacology as defined by the Pharmaceutical Syllabus, and by lexicographers generally, is the "science that treats of drugs and medicines; their nature, preparation, administration and effect; including pharmacognosy, pharmaco-dynamics, therapy-dynamics, pharmaceutical chemistry and pharmacy." The pharmacologic arts are the arts of selecting, preparing, standardizing, preserving, prescribing, compounding and dispensing medicine, and applying the same for the prevention of disease, the mitigation of suffering, and the healing of the sick.

How can progress in the science of pharmacology and the useful arts upon which that science is dependent best be promoted? Evidently progress can best be promoted by coöperation between the educational and industrial institutions related to pharmacology, and the practice of pharmacognosy, pharmaceutical chemistry, pharmacy and pharmaco-therapy. Why is the great question of promotion of special importance at the present time? It is especially important at the present time because pharmaco-therapy, which has been forced out of the curricula of the medical schools and colleges by the teaching of surgical specialties, is to be reinstated, and because we are seriously considering the reorganization of the American Pharmaceutical Association, and should not neglect the opportunity of reorganizing in a way to meet the scientific and professional requirements of this pharmaco-therapeutic renaissance and aid the schools of pharmacy in placing themselves in position to meet these requirements also.

What stands in our way of accomplishing this great object? There are a number of serious obstacles to which your attention is invited.

1. *Misapprehension of the Relations That Pharmacy Should Bear to Medical Science and Practice.*—Professor C. S. N. Hallberg, in an address before the Alumni Association of the Philadelphia Medico-Chirurgical College, said: "I see before me a classmate whom I have fought all my life because he opposed the dividing of pharmacy from medicine to make it a separate profession. Mature study of this important subject convinces me that the greatest mistake we have ever made is in the attempt to do this. Pharmacy cannot exist as a profession when separated from medicine. My classmate was right, and we have all been wrong."

Why cannot pharmacy exist as a separate profession from medicine? There are many reasons. The chief of which are these:

In the first place, pharmacy cannot exist as a science when separated from medical science because pharmacy is only part of medical science. As stated by the Standard Dictionary: "Knowledge of a single fact, not known as related to any other, or of many facts not known as having any mutual relations or as comprehended under any general law, does not reach the meaning of science; science is knowledge reduced to law and embodied in system. The knowledge of various countries gathered by an observant traveler may be a heterogeneous medley of facts, which gain real value only when coördinated and arranged by the man of science." "Science is knowledge gained and verified by exact observation and correct thinking, especially as methodically formulated and arranged in a rational system." These facts were apparently appreciated by the "National Committee representing the American Pharmaceutical Association, the American Conference

of Pharmaceutical Faculties, and the National Association of Boards of Pharmacy," when it formulated its Pharmaceutical Syllabus, "Outlining a minimum course of instruction" in pharmacologic science and arts of "three hundred hours' " duration.

The intent of the National Committee, representing the educational institutions of pharmacy, is that the graduates of the pharmaceutical schools and colleges shall be educated in pharmacognosy or "the art of identifying, selecting and valuing drugs;" that the pharmacist shall be acquainted with the subject of pharmacodynamics, or "the action of drugs on healthy tissues;" that he shall also know something about therapy-dynamics, or "the action of drugs on diseased tissues;" that he shall be reasonably intelligent concerning "the administration of drugs," and this requires some knowledge of physiology, pathology, symptomatology and diagnosis; and, finally, he shall be in a position to serve the medical profession and the public at large in a practical manner as a pharmaceutical chemist and pharmacist, guided, in so doing, by his knowledge of "drugs and medicines; their nature, preparation, administration and effect."

We lament the decadence of true pharmacy. How long, I ask you, would pharmacy remain decadent if the graduates of the pharmaceutical schools and colleges went out into life properly armed with the knowledge of pharmacologic science and arts, and used it properly in coördinate practice with the medical profession? Pharmacists with such education would not set up as physicians and prescribe without diagnosis, and thus increase the difficulty of obtaining coöperation between medicine and pharmacy; neither would they aid the manufacturers of nostrums in doing so. A properly educated pharmaceutical profession would stand between the nostrum business of all kinds on the one side, and the medical profession and general public on the other, as an effectual buffer. Such a profession would exert a strong deterrent influence against the commercial introduction of alleged new remedies by misleading advertising, instead of acting as sales agents for their manufacturers.

2. *Misapprehension of the Obligations Imposed upon Pharmacists on Accepting License to Practice Pharmacy.*—Some time ago I asked the president of a state pharmaceutical association what obligations he accepted when he accepted his license to practice pharmacy. He replied: "What do you mean? I am licensed to sell everything for which there is a demand." And this president of a state pharmaceutical society, well known in his community as a man of integrity, was not a little startled when I called to his attention that one of the obligations assumed with his license was not to sell everything demanded, but to refuse to sell anything that he knew as an educated pharmacist was inimical to the public health. The importance of this fact should not be lost to sight now that the teaching of preventive medicine takes the lead in the public mind as of more importance than the diagnosis and treatment of disease. This wave of public health teaching is spreading all over the world especially since the close of the great World War, and conferences are being held frequently to secure closer coöperation between the various agencies engaged in combatting disease with preventive methods. One of the causes of disease is the abuse of drugs, and it is decidedly to the interest of the legitimate drug business in all departments to coöperate with these agencies in this great movement for the conservation of health.

3. *Misapprehension in Regard to the Importance of Drug Standardization.*—

One of the causes of therapeutic nihilism is the uncertainty of action on the part of drugs. This cause was not appreciated to the extent it is now because in times past there were no instruments of precision for determining quantitative pharmacodynamic action. Two factors of uncertainty exist, one pertaining to the drug, and the other to the patient. Drug standardization removes one of them and thus gives the physician better opportunity to study the other when called to the bedside. The modern method of giving digitalis in massive doses would be very unsafe except for digitalis standardization. A tincture of digitalis made from a drug selected by the aid of the art of pharmacognosy, and standardized by modern pharmacodynamic methods, is a very different preparation than the tincture prepared, as it used to be made, from a drug purchased from the wholesaler without proper inspection, and made into a tincture for dispensing without ascertaining whether the finished product conformed to a definite standard of strength. It is not surprising that the Bureau of Hygiene found that the tinctures of digitalis on the market varied as much as three hundred per cent. when this fact is considered. But standardization adds to the cost, and pharmacists who do not appreciate the importance of standardization object to paying the price for standardized products. Here, again, the responsibility imposed upon the pharmacist when he accepts his license to practice pharmacy is often forgotten. I had the pleasure of meeting a pharmacist in Scotland who told me that he had built up a profitable pharmaceutical business by featuring drug standardization. By persistent use of advertising methods in which personal calls on physicians and leading business men were part he educated his clientele to a just appreciation of standardization as a factor of importance and they were willing to pay the extra cost of this professional service.

The introduction of galenical standardization met strong opposition when first proposed for admission to the U. S. Pharmacopœia on the ground that it would force the retail druggists to purchase from the manufacturing houses instead of making their own preparations. But the gain in therapeutic efficiency due to uniformity was so satisfactory to all concerned that the next revision showed an increase in the number of standardized products. The era of pharmaco-therapeutic renaissance now being ushered in by the work of the great pharmacologists and clinicians will doubtless still further increase the demand for standardized pharmaceutical preparations.

4. *Misapprehension of the Relations of Pharmacists and Physicians to the Field of Domestic Medicine.*—In a public lecture on "Health and Disease," by Prof. George Dock, M.D., of Washington University, he gave the following advice to the "individual who would obtain and maintain good health:"

He should in the first place select his grandparents and parents in such a way as to get himself the best constitution possible. He should live so as to preserve that constitution. He should know how to apply simple remedies for the trifling ailments that afflict one—to use a cathartic when he has eaten something indigestible; to dress a wound aseptically; to stop food when the stomach rebels. He should be so educated by his parents, his teachers, his school physicians, his school nurses, his city or village health officers, and in his college hygiene course, as to secure the greatest possible freedom from disease.

It is evident that Dr. Dock recognizes the "right of self-medication" possessed

by the public. It is also the right, and the duty, of physicians and pharmacists, as guardians of the public health, to educate the public<sup>1</sup> in regard to the proper use of medicines in domestic practice. To do this the pharmacist must be taught as much and more about disease and its treatment than is being taught the layman. Let me quote again from the same author showing what he is teaching the layman.

We are all in the habit of thinking of diseases as if they had separate existences. In fact they are spoken of sometimes as entities—"beings without reference to distinguishing attributes or properties," but in reality there are no such things—there are only people, or lower animals, or plants, with diseases. One cannot think clearly about diseases without thinking of the causes. Headache, for example, occurs from such dissimilar things as infectious diseases, like influenza, typhoid fever or smallpox; or it may come from disease of the eye, or ear; from meningitis, brain tumor, kidney disease, chronic digestive disturbance; nervous exhaustion or anemia or some other cause. Cough is equally misleading. It may come from a disease of the larynx, or bronchi; it may also come from a disease of the ear or pharynx, the tonsils, pleura, heart, stomach, or lower abdominal organs. The pus or polyp observed on examination of the sinuses is a sign. From the symptoms and the signs the physician works up the complete picture of the disease, that is, the diagnosis.

The therapeutic renaissance to which I have referred includes an aggressive propaganda of education for teaching the medical profession and the public at large the proper use of drugs as therapeutic agents. The effect of this teaching upon the physician and layman, both of whom, unfortunately, are deficient at the present time, of knowledge concerning this important subject, is sure to materially influence the character of the demand for drugs. Mackenzie points out that medical treatment has always been in advance of knowledge, that treatment has been empiric, even experimental, and that knowledge has come later from the results of these unorganized attempts to palliate or cure the diseases of man, and he expresses the hope that eventually knowledge will precede treatment and that treatment will be based on knowledge, and not, as heretofore, largely on empiricism.

Mackenzie's hope is evidently to be realized in the not distant future. The American Therapeutic Society has taken up the subject in earnest, also the American Medical Association, the American College of Physicians and the American Association of Physicians and Surgeons. The new pharmaco-therapy will have the science of pharmacology as its foundation. And the physicians of the future will demand profound knowledge of that science upon the part of the pharmacists and manufacturers. If the pharmaceutical profession and manufacturers are found wanting the medical societies will find a way to meet the demand for proper pharmacologic service.

5. *Misapprehension of the Ethical Obligations of the Pharmacist to the Physician and the Public at Large.*—The pharmacist in accepting his license accepts with such license the obligation to practice his vocation in compliance with ethical requirements which are the same as those of medicine. There can be no two codes of ethics, one for medicine and one for pharmacy, because pharmacy is a branch of medical practice.

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<sup>1</sup> In 1909, The Metropolitan Life Insurance Company began a systematic campaign to lengthen the lives of its industrial policy holders. The report to Jan. 1, 1922, shows that to that date there were distributed 20,223,368 booklets and pamphlets, an average of more than 20 million annually. The improvement in industrial mortality in 1921, over 1911, gives a saving of 55,000 lives, which, measured in terms of dollars and cents, means a saving of \$11,537,820 in death claims.

The medical profession, as you know, is a fraternity bound together by a code of ethics, the principles of which have been handed down from the time of Hippocrates—400 B. C. These principles are those of fraternity, altruism and beneficence. Obedience is necessary for the very existence of medicine as a profession. If the public at large ever loses confidence in the medical profession regarding obedience to these principles the profession is doomed.

The code of medical ethics obligates every physician to donate the results of his investigations and discoveries in the domain of medicine to the profession so that every physician the world over may have the opportunity of using it immediately in treating the sick. Monopoly of such discoveries is rightly considered an ethical crime against humanity. For the same reason the physician is under obligation to teach his fellow practitioners how to use these inventions and discoveries. In other words, he is not permitted to make a monopoly of them and introduce their use by misleading advertising so that he may acquire exclusive right to their manufacture and sale. It is evident, therefore; that there can be no coöperation between the medical professional and industrial institutions engaged in the introduction of alleged new remedies under a system of monopoly and misleading advertising.

Furthermore, it is necessary for the physician to know the exact truth regarding an alleged new remedy, which, of course, includes its untoward effects and limitations and comparative therapeutic value with other remedies, both new and old, recommended for the same purposes.

Before an alleged new remedy is placed on the market for sale its merits must be submitted to scientific tests and recorded and standards adopted to assure its identity, character, quality and strength, otherwise uniformity in action cannot be assured. It is for this reason, among others, that common standards, or pharmacopœias are necessary. Such standardization having been acquired, the next step in testing its merits consists of experimentation on healthy and diseased tissues to determine its pharmaco-dynamic and therapy-dynamic properties. These having been determined and also recorded the next step consists in submitting the alleged remedy to clinical test in hospital and private practice to obtain a therapeutic verdict.

Therapeutic verdicts can only be obtained as the products of many clinical researches carried on by competent observers and extending over long periods of time—researches conducted under conditions of environment which eliminate as far as possible the personal equation and errors due to differences in climate, race and social state.

It is evident, therefore, that the proper introduction of new therapeutic agents to science requires the entire educational machinery of medicine and pharmacy, including the laboratories and lecture rooms of the medical and pharmaceutical schools and colleges, medical and pharmaceutical societies and press, hospitals and other clinical institutions, and the medical and pharmaceutical professions at large. It is also evident that there can be no coöperation between the educational institutions and the commercial introducers of commercially controlled materia medica products without converting this educational machinery into a great advertising bureau for the teaching of error due to commercial exploitation. To what extent therapeutic nihilism is due to the exploitation of the educational

institutions already permitted to a certain extent is a question difficult to answer. Prominent physicians believe such exploitation to be one of the causes.

What is the remedy for this state of affairs? It is to be found in the abolition of monopoly, and the adoption of coöperation between the educational and industrial institutions related to the *materia medica* in the introduction of new *materia medica products* to science and *brands* of the same to commerce.

For example, condensed milk is a product. There are several brands of condensed milk on the market, as, for instance, the "Eagle" brand, "Anglo-Swiss" brand, "White Cross" brand, etc. Progress in the knowledge of condensed milk as a food is dependent upon the impartial discussion of the product by persons competent to discuss it, namely, dieticians and physicians. These discussions must be conducted under conditions which assure their impartiality. Experts in the employ of the condensed milk manufacturers are in position to place valuable evidence in favor of condensed milk as a food, and should be encouraged to do so, but they are advocates, not judges, not because of intent to mislead, but on account of very natural bias. They should, and doubtless would, work in coöperation with the experts employed by the industrial institutions, if permitted. But they could not do so under a system of monopoly and the subsidy of the medical and food journals by the monopolists. Take diphtheria antitoxin, as another example. It, too, has been introduced to science by experts working in the laboratories of educational institutions, consequently the knowledge of the product has developed properly along scientific lines. And the industrial producers have coöperated in promoting scientific knowledge by advertising their brands in the medical journals and by means of stock lectures, lantern slides, moving pictures, and working bulletins. And the experts employed by the producers have added much to scientific literature by their contributions to the professional societies and professional press.

6. *Misapprehension of the Objects of the Copyright, Patent and Trade-Mark Laws.*—In my last report as chairman of the Committee on Patents and Trade-marks this misapprehension was treated at some length and as the subject is of so much importance to all concerned I will refer you to it rather than to encroach upon the limited time allotted to this Section. In this report, which appears on page 561, in the July number of the *JOURNAL* for 1922, you will note how the marvelous coöperation between educational and industrial institutions was obtained in Germany and how this coöperation had great influence in promoting the scientific and commercial prosperity of that nation before the great World War.

In this year's report of the Committee you will find reference to the action of the American Therapeutic Society in regard to the German method made possible by the patent system of that country which did not permit monopoly of medicines, foods, or chemical substances, but did permit the patenting of brands by process patents. And the German government further protected these industries from unfair competition by laws against misleading methods of advertising, and their strict enforcement.

You will also find in the report reference to the action of the American Therapeutic Society in regard to a system of protecting legitimate pharmaceutical and pharmaceutical industries engaged in research work and the commercial introduction

of new products resulting therefrom suggested by Mr. Milton Campbell, president of the H. K. Mulford Company, of Philadelphia, manufacturing and biological chemists.

7. *Mr. Campbell's Plan for Coördination between Educational and Industrial Institutions for the Coöperative Introduction of New Materia Medica Products to Science and Brands of the Same to Commerce.*—Mr. Campbell's plan recognizes the importance of promoting progress in the science of pharmacology and the useful arts upon which that science is dependent by coördinate coöperative work by the educational and industrial institutions related to the materia medica supply business. It recognizes that investigations in many branches of science are necessary to develop knowledge of new medicinal drugs and chemicals, including vaccines, bacterins, serobacterins, antitoxins and immune serums, all being substances used in medicines and therefore coming under the classification "materia medica." Physics, chemistry, biology, botany, bacteriology, physiology, pathology, therapy, immunology, and other branches—all must be drawn upon to promote the science of materia medica, *i. e.*, the science of pharmacology. And all who are engaged in the development of this science must obtain a living directly or indirectly from materia medica commerce unless they are employed in the laboratories of educational institutions, or of the Government, or engaged in teaching.

Under the system of coördination and the introduction of new materia medica products to science, and brands of the same to commerce, advocated by Mr. Campbell, since there can be no monopoly, it is safe to open the doors of the educational institutions with their laboratories, hospitals, clinics and teaching staff to coöperative research and educational work on the part of the experts employed by the industrial institutions. There is no danger that by so doing the educational institutions will be converted into a great advertising bureau for the exploiting of commercially controlled products and the exploitation of the sick for commercial purposes, because no statements are allowable excepting those made by disinterested scientists and institutions.

Mr. Campbell's plan includes two license systems, namely, licenses annually granted to non-commercial institutions permitting them to manufacture and use patented materia medica products for educational and beneficent purposes, but not for sale, and annual licenses granted competitors engaged in the commercial introduction of such products on a royalty basis.

As the object of the plan is to promote progress in the science of pharmacology and the arts upon which that science is dependent by coöperation between the educational and industrial institutions related to the materia medica supply business, the licenses given either classes of institutions require the adoption of common standards and common nomenclature to fix the identity and determine the character, quality and strength of the licensed products; and no licenses are to be granted to industrial institutions except upon their agreeing to extend the same licensing privileges to others in regard to their own inventions and discoveries, and to comply in every respect with and accept in full the ethical policy founded by the plan.

*Advantages of Mr. Campbell's Plan.*—The great advantage of Mr. Campbell's plan is that it does away with monopoly and places the introduction of new materia medica products on a coöperative basis. The burden of expense attending the introduction is shared between the edu-



cational and industrial institutions; the artificial demand created by advocates of alleged new remedies is corrected by impartial discussions in medical societies and medical press. Brands are advertised in the advertising pages of the medical journals without endangering the integrity of the reading pages, and the more brands advertised the less the danger. These advantages may be summed up as follows:

1. It stimulates materia medica research and the publication of the results by donations to the professional societies and professional press, and thus increases the value of both as educational institutions.

2. The increased value of the medical journals as media for conveying knowledge concerning new products increases their circulation, and this, in turn, increases their value to the manufacturers of brands of the same as advertising media.

3. It stimulates competition between the manufacturers of brands to excel in quality of product. The license system insures common standards, yet quality of products made in accordance with common standards differs on account of differences in the skill of the producer.

4. The temptation to decry the merits of new products because of commercial rivalry is removed and desire to promote the investigation and use of such products is substituted for it because of the realizing sense that the introduction of each new product of therapeutic merit is profitable to all, as all are equally concerned.

5. It lifts the embargo on the medical press imposed by the monopoly system and permits the medical journals to impartially discuss the therapeutic claims for new products in their reading columns without fear of losing advertising patronage. For example, the advertising of brands of diphtheria antitoxin in the advertising columns of the medical journals has not hindered the impartial discussion of the therapeutic value of diphtheria antitoxin in the reading columns.

6. It permits medical scientists to enter the employ of the industrial institutions engaged in the pharmacal and pharmaco-chemical industries to do research work for monetary reward as well as scientific credit, thus encouraging them to chose research work as a vocation. Under the prevailing competitive system research work in commercial laboratories is discouraged.

7. It permits the medical and pharmaceutical schools and colleges to throw open their laboratories to research workers for solving problems of both scientific and commercial importance for the industrial institutions without danger of charges of collusion.

8. It places the faculties of the medical and pharmaceutical schools and colleges in position to teach their students knowledge relating to the more recent additions to the materia medica without the danger of unwittingly teaching errors due to commercial exploitation.

9. It creates a demand for departments in educational institutions for the teaching of pharmacologic science and the arts upon which that science is dependent to meet the requirements of the era of therapeutic renaissance now before us.

10. It creates a new and most promising field of work for the graduates of such institutions in the employ of industrial institutions carrying on their vocation in coöperation and coördination with the medical and pharmaceutical schools and colleges.

11. It places the pharmacal and pharmaco-chemical industries on a professional basis of such character that capital invested in research work may receive the protection afforded by the correct application of the patent and trademark laws without violating the ethical principles upon which the practice of medicine is founded.

12. And, finally, the plan is based upon sound business principles, is practical, is protective alike to educational and industrial institutions, protective to the medical and pharmaceutical press and its advertising patronage, and protective to the public health and general welfare.

#### COMMENTS AND CONCLUSIONS.

Now what has all this to do with my subject, "Pharmaco-Therapeutic Institutions?" It has much to do with it. An institution, according to the Standard Dictionary, is "that which is instituted or established; an established order, principle, law or usage; a system of laws or of polity, especially as an element of organized society or of civilization; as the *institution* of chivalry, the *institution* of slavery." Here we are dealing with the institutions of pharmacology and pharmaco-therapy.

Pharmacology is an institution, but separated from medicine it is a body without a soul. Pharmacy is an institution, but separated from pharmacology it ceases to be an institution and becomes a wreck. "What is the matter of pharmacy?" This question is not difficult to answer in the light of the above facts. What have we learned by considering these facts? We have learned that pharmacy and pharmacotherapy are parts of the science of pharmacology. We have learned that students of pharmacy and of medicine must be coordinately educated in the science of pharmacology to enable them to practice in coordination and cooperation. We have learned that pharmacology and the pharmacologic arts are part of the science and practice of medicine, and, therefore, must be practiced in harmony with the code of medical ethics handed down from the time of Hippocrates. We have learned that the business of the pharmacist and manufacturing house engaged in the pharmal or pharmaco-chemical industry is a professional business, not a commercial business in the sense that the term "commercial" is usually employed. We have learned that the "commercial" method of introducing alleged new remedies by misleading advertising is a menace to public health, whether the advertising is directed to the medical profession or the general public. We have learned that commercial monopoly of new materia medica products is inimical to the public welfare for it is a hindrance to the physician in the use of agents necessary to the prevention of disease, the relief of suffering, and the healing of the sick. We have learned that the embargo placed upon the medical press by the monopolistic system relating to the commercial introduction of therapeutic agents by advertising prevents impartial discussion of such agents by the medical journals, hinders the free diffusion of knowledge, and promotes the teaching of error. We have learned that the patent and trademark laws are being perverted to protect secrecy and monopoly owing to misapprehension of their meaning and misapplication by the Patent Office and the Courts. And, finally, we have learned that the practitioners of all medical arts are bound by the code of ethics, and also by the obligations accepted by them when they accepted their license to practice, to do those things which promote the public health, including cooperation and coordination in practice and teaching; therefore, it is the duty of all physicians and pharmacists to donate the results of their researches and experiences to the common good for the benefit of their profession and the public welfare.

The functions of pharmaco-therapeutic institutions are either educational or industrial, or both. The functions of the physician's office, the drug store, and the great manufacturing houses engaged in the materia medica supply business are both educational and industrial, and there should be coordination and cooperation between them in serving the medical profession and the general public with medicines and correct information concerning them. The fact that the boundaries of the fields of service overlap and can never be definitely defined has always caused friction between the practitioners of medicine and pharmacy. The remedy is to be found in education of both in pharmacologic science and arts in coordination by adopting a coordinate curriculum for the teaching of medical and pharmaceutical students and coordinate practice after graduation. The practice of medicine and pharmacy is seriously threatened with invasion by the practitioners of drugless cults, and the medical profession is asking cooperation on the part of pharmacists in repelling the invasion as a matter of protection of public health. This coopera-

tion can never be brought about until the medical profession recognizes that pharmacy is an important part of medical practice, and physicians are willing to cooperate with pharmacists, and they with physicians, in pharmaco-therapeutic service.

The first step for the accomplishment of this desirable object must be the banishment of all systems of monopoly in pharmacologic practice, and the substitution of cooperation in place of competition in the introduction of new materia medica products, and the opening up of the educational institutions for the coordinate teaching of pharmacology to the medical and pharmaceutical students and practitioners of medicine and pharmacy. And it seems to me that the plan for the coordinate and cooperate introduction of materia medica products to science and brands of the same to commerce points out the way.

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### IMPROVED FORMULA FOR A TESTING INK FOR STERILIZERS AND AUTOCLAVES.\*

BY IVOR GRIFFITH.

There have been placed upon the market several expedients for determining the reliability and accuracy of the numerous sterilization methods. Among the most popular of these articles might be named the tablets and powder tubes containing some mercuric compounds which have the power of radically changing color when the desired sterilization temperature has been reached. However, because of the expense of the available market articles, experimenters have attempted to work out some other method of obtaining the same results.

There recently appeared in a Hospital Journal a working formula for a so-called sterilizing ink. This ink was designed to be used in marking surgical dressings prior to their introduction to the sterilizing chamber, and the original color of the ink, which was red, would change, when sterilization temperature had been obtained, into a distinctly different color. Experimentation with this ink, however, proved it to be unsatisfactory in many respects. The so-called working formula refused to work, and the directions for compounding were entirely contrary to the usual practice.

Utilizing this formula as a working basis, the following recipe was conceived, and is perfectly capable of being transformed into a satisfactory article. There are advantages in compounding this ink in small quantities because of changes which occur when the ink is kept on hand too long. However, it has been our experience that ink in unopened bottles will keep unchanged for a long time, particularly if kept in amber-colored containers and away from the light. Formula:

Carmine.....	3 Gm.
Silver nitrate.....	30 Gm.
Potassium bitartrate .....	30 Gm.
Stronger ammonia water.....	120 cc
Simple syrup.....	15 cc
Mucilage of acacia.....	15 cc

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\* Read before Section on Practical Pharmacy and Dispensing, A. Ph. A., Cleveland meeting, 1922.