Opinions and arguments, either for or against inclusion, will all be given careful and thoughtful consideration. The Revision Committee welcomes and invites the fullest coöperation of pharmacists and all those who are interested in the welfare and advancement of the profession. If the National Formulary V, as a practical working formulary, fails to measure up to the high standard which the pharmacists of the country have the right to expect, they will, at least, share in the blame if they do not participate in the revision."[1]

ELIXIRS OF THE UNITED STATES PHARMACOPOEIA AND NATIONAL FORMULARY.*

BY BERNARD FANTUS AND CLYDE M. SNOW.

The official elixirs are intended to be the most elegant liquid preparations the pharmacist's art can devise. They should be of pleasing appearance, and of the most pleasant possible odor and taste, consistent with full therapeutic efficiency. They are, in fact, medicated liqueurs, the pleasantness of alcoholic liquors being made use of for the administration of medicaments. Still they should not be available as intoxicants. The alcohol contained in them should, therefore, be *just* sufficient for solvent and preservative purposes; there should be no more of it, and no less.

Both of the elixirs of the U. S. P. IX, the *aromatic elixir*, and the *elixir of glycyrrhiza*, contain approximately 25% alcohol. This is sometimes too much and sometimes not enough. Thus, if these elixirs are to serve as vehicles for sodium bromide, potassium acetate, or sodium salicylate, no such amount as 25% of alcohol is required or desirable. If, on the other hand, they are to be used as diluents for fluidextract of cannabis indica or fluidextract of buchu, they are decidedly deficient in alcohol; and in both cases turbid unsightly mixtures result.

ISO-ALCOHOLIC ELIXIRS.

The difficulty brought out could be overcome if the Pharmacopoeia would make the elixir *iso-alcoholic*,[2] that is, would direct the pharmacist to dispense an elixir of an alcoholic strength, just sufficient to dissolve the medicament for which the elixir is to serve as a vehicle. To accomplish this, the Pharmacopoeia would have to recognize two basic aromatic elixirs: first, an aqueous elixir containing only 5% alcohol; and, secondly, an alcoholic elixir containing approximately 95% alcohol. These two would have to be mixable with each other in all required proportions.

An *aqueous elixir* of the following composition has been found to possess entirely satisfactory flavor, taste, and keeping qualities. It would be used for

---

[1] The article closed with General Principles governing the revision. The following references are made to articles in the JOUR. A. PH. A., Volume IX, 1920, June, p. 597; August, pp. 760 and 852; September, p. 934. See also report of Pittsburgh Branch A. Ph. A., March 1921, issue of JOUR. A. PH. A,—The Editor.

* From the Pharmacy Laboratory of the University of Illinois. Presented before the Chicago Branch of the American Pharmaceutical Association, Jan. 21, 1921.

[2] B. Fantus, "Iso-Alcoholic Elixirs," JOUR. A. PH. A., 9, 708, 1920.

water-soluble medicaments, for most of which it is decidedly preferable to the now official 25% elixir, as alcohol increases the taste intensity of salty and sour substances.

Compound spirit of orange	10.0
Syrup	375.0
Purified talc	30.0
Alcohol	50.0
Glycerin	200.0
Distilled water, to make	1000.0

Mix the compound spirit of orange with the alcohol. Add the glycerin, syrup, and then the water, each of these in several portions, agitating after each addition. Mix the purified talc intimately with the liquid, and then filter through a wetted filter, returning the first portion of the filtrate until a transparent liquid is obtained.

The *alcoholic elixir* might have the following composition:

Compound spirit of orange	1.0
*Benzosulphinide	1.0
Alcohol, to make	1000.0

The alcoholic elixir is strong enough in alcohol to mix in all proportions with preparations containing 95% of alcohol. It can be mixed with the aqueous elixir in proportions up to 1 to 3 perfectly clear, and in ratio of 1 to 4 with but a trace of cloudiness at room temperature.

Iso-alcoholic elixirs of intermediate strength should be made by mixture of the two elixirs in the same proportions as those of water and alcohol in the menstruum employed in the preparation of the medicament to be added to the elixir, or solvent required by it.

The following experiments furnish proof of the necessity of this reform:

1. Tincture of digitalis 0.5 Cc. mixed with enough aromatic elixir to make a teaspoonful gives a copious flocculent precipitate. The same dose added to a mixture of alcoholic elixir 3 parts, aqueous elixir 1 part—the proportions of alcohol and water used in the menstruum—is, of course, perfectly clear.

2. Tincture of veratrum viride, 0.5 Cc. added to aromatic elixir 4 Cc., precipitates even more copiously than does the digitalis mixture. Using the alcoholic elixir, which is required by the strongly alcoholic menstruum employed in the extraction of the drug, yields a perfectly clear and safe preparation.

3. Tincture of aconite 0.3 Cc., whose menstruum is alcohol 7, water 3, precipitates with the aromatic elixir 4 Cc.; but naturally does not, when added to iso-alcoholic elixir made in the proportions of alcoholic elixir 7 to aqueous elixir 3.

4. Tincture nux vomica 0.5 Cc. plus aromatic elixir 4 Cc. is cloudy. The same dose added to the proper mixture of alcoholic and aqueous elixirs, 3 to 1, remains clear.

5. Tincture of colchicum seed, 2 Cc., added to aromatic elixir, throws down a few flocculi. Using alcoholic elixir 3, and aqueous elixir 2, gives a clear preparation.

6. Tincture of lobelia, 1 Cc., added to a mixture of equal parts of aqueous and alcoholic elixirs remains clear, while precipitate forms with the aromatic elixir.

In all these experiments, the average pharmacopoeial dose was added to enough elixir to make a teaspoonful. The turbidity resulting in all these cases with the aromatic elixir of the U. S. P. is not only unsightly but introduces an element of

* Sugar is not sufficiently soluble in alcohol. Hence saccharin is used, which in the quantities under consideration is surely unobjectionable.

danger, as presumably many of these precipitates are toxic. Insufficient shaking of the bottle before taking would lead to possibly dangerous inequality of dosage. If, on the other hand, the iso-alcoholic elixirs were introduced into the Pharmacopoeia and it were understood that the pharmacist would take care of the proper alcoholic strength of this vehicle, the physician—who can hardly keep in mind the alcoholic strength of all the menstrua used in the extraction of drugs—would not have to worry about incompatibility or alcohol-solubility. The pharmacist, on the other hand, could easily, by means of his reference books, adjust to a nicety the alcohol percentage required.

Incidentally it might be noted that the alcoholic elixir we propose, as it contains no sugar, might be used as a pleasant vehicle for medicaments intended for the diabetic, in whom the sugar-containing aromatic elixir would be contra-indicated.

VEHICLE ELIXIRS.

The *elixir of glycyrrhiza* of the U. S. P. IX consists merely of the addition of fluidextract of glycyrrhiza (12.5%) to aromatic elixir. Not only does it suffer from the just presented defects of the aromatic elixir; but it is so simple a mixture that, in our opinion, there is no need for it in the Pharmacopoeia. Any physician desiring such a preparation might easily prescribe it by designating its two ingredients. We recommend that, in its stead, be introduced, under the above name, the *aqueous elixir of glycyrrhiza* of N. F. IV, which contains only about 5% of alcohol and the aroma of the compound spirit of cardamom and of orange flower water, which makes the licorice flavor decidedly pleasant. We have found this a delightful vehicle—the best in our experiments for salines, such as sodium bromide, potassium acetate, sodium salicylate. Unfortunately, it is precipitated by the addition of considerable quantities of alcohol, hence it cannot serve as an iso-alcoholic elixir, unless the colloidal materials of glycyrrhiza precipitated by alcohol be absent. This could be secured by using ammoniated glycyrrhizin instead of the fluidextract of glycyrrhiza. However, when ammoniated glycyrrhizin is used for this purpose, we miss the disguising quality for salines noted in connection with the N. F. aqueous elixir. Evidently this quality is due to the alcohol-precipitable colloids. Hence the preparation at present official is to be preferred. There seems no necessity for continuing the *aromatic elixir of glycyrrhiza* in the next revision of the N. F. Its use is certainly very limited; and, as far as we can see, it is not superior to the aqueous elixir of glycyrrhiza.

The N. F. *red elixir*, which contains 0.2% cudbear in aromatic elixir, would lend itself completely to the purposes of iso-alcoholic elixirs, by the mere addition of cudbear to the aqueous and the alcoholic elixirs, respectively. There is a slight difference in the color of the two preparations, but it is not sufficiently great to be noticed unless the two liquids are side by side, and compared critically.

The *compound elixir of almond* is suitable to serve as an elegant aqueous elixir without further modification. It contains only 5% of alcohol.

The *compound elixir of cardamom* and the *compound elixir of vanillin*, which contain approximately 10% of alcohol, might easily have their alcohol strength reduced to 5% without detriment to their palatability or impairment of utility as vehicles.

The *elixir of anise*, which contains 25% of alcohol, may, by reducing the quantity of alcohol to 5%, be made into an aqueous elixir that is decidedly palatable, though, of course, it somewhat lacks the "kick" of the more strongly alcoholic preparation. Inasmuch, however, as the elixir of anise is particularly likely to be used as a flavoring for children's medication, an intoxicating vehicle would certainly be undesirable.

There are many physicians who use the *elixir of pepsin* and the *compound elixir of pepsin and rennin* as vehicles. There is no scientific foundation for this, inasmuch as the digestive ferments are practically never absent from the stomach in cases of dyspepsia, and it is difficult to see how the presence of these ferments in a medicament could make it more acceptable to a stomach that has an abundance of ferments, especially as it is well known that as light increase in the amount of ferment does not measurably increase digestive activity.

The practice is, no doubt, a survival of the day—not so long past—when the digestive ferments were hailed, even in scientific circles, as a panacea for digestive disorders. Commercial interests have been and are still at work to keep this fallacy alive. Inasmuch as it is the "purpose of the National Formulary to supply definite formulas for preparations sufficiently used in medical practice," and the "National Formulary does not assume any responsibility for the therapeutic value of any preparation,"[1] there can be no objection to continuing these formulas in the next revision. However, the amount of alcohol should be decidedly reduced, as this would not only be more economical and render these preparations less suitable to be used as intoxicants, but also of advantage to the digestive ferments, as alcohol is destructive to them. The formula could furthermore be much improved by change of the vehicle. We find that the flavor of the aromatic elixir does not cover the rather disagreeable odor of pepsin. After trying the series of vehicle elixirs of the N. F., we have decided that the *compound elixir of almond* gives the most pleasant disguise. The taste of a dose of the elixir of pepsin prepared with the elixir of almond reminds one strongly of "cherry phosphate." We, therefore, recommend this modification of the elixir of pepsin, and that corresponding changes be made in the *compound elixir of pepsin and rennin.*

The taste of *glycerinated elixir of gentian* made with aqueous aromatic elixir is decidedly more pleasant than that of the N. F. elixir, which tastes considerably sourer, though both be made with exactly the same amount of phosphoric acid. Another evidence, if more were needed, of the fact that alcohol increases salty and sour taste sensations. The flavor of the two is so nearly alike that the wisdom of wasting sherry wine on the combination may well be doubted. The N. F. also contains an *elixir of gentian*, which was especially designed to be used in the preparation of the elixir of gentian and iron. The glycerinated elixir is, however, so much pleasanter and can be so readily medicated with the tincture of ferric citrochloride without the occurrence of discoloration, that we can see no need for recognizing the two gentian elixirs. We therefore favor the deletion of the elixir of gentian from the N. F., and the use of the aqueous glycerinated elixir in the preparation of the elixir of gentian and iron.

[1] "General Principles to Be Followed in Revising the National Formulary," JOUR. A. PH. A., 9, 852, 1920.

The *compound elixir of taraxacum* would be improved by employing the aqueous aromatic elixir instead of the U. S. P. aromatic elixir of the formula in the N. F. It is a decidedly more palatable preparation.

The *aromatic elixir of eriodictyon* prepared with the aqueous compound elixir of taraxacum is so similar to the N. F. IV preparation that the difference can hardly be detected. However, this elixir, which is obviously intended as a vehicle for bitter drugs, precipitates heavily when medicated with cinchona alkaloids. We, therefore, propose that the elixir of eriodictyon be prepared with elixir iso-alcoholic to the fluidextract of eriodictyon (alcoholic elixir 4, aqueous elixir 1), which yields a clear product when the fluidextract of eriodictyon is added; and which forms an admirable vehicle for bitter drugs.

One or the other of the above-described vehicle elixirs might with advantage be introduced into the Pharmacopoeia, which would give it greater prominence and more use, as physicians unfortunately are even less acquainted with the N. F. than they are with the U. S. P. In the art of prescribing, a good knowledge of vehicles is of the same importance as a liberal variety of spices and condiments in the art of cooking. Just as "we can live without art, but not so well," so we can get along without artistic perfection of our medicaments, but by no means so well.

While the National Formulary, as we have just noted, contains quite a variety of elegant vehicle elixirs, it is a curious fact that the Formulary does not itself make use of this variety, but directs nearly all the medicated elixirs to be made by the mere addition of the medicament to the aromatic elixir. This would be excusable if aromatic elixir were the ideal all-round vehicle; but this is, as we shall see, by no means the case. Each of the N. F. elixirs ought to represent a masterpiece of the pharmacist's art; and experiments have convinced us that each elixir, or at least each class of elixirs, requires individual study.

ELIXIRS CONTAINING ALCOHOL-SOLUBLE DRUGS.

A good example of the utter inadequacy of the present aromatic elixir as a vehicle for drugs containing water-insoluble principles, is the N. F. *elixir of buchu*, each teaspoonful of which is supposed to represent 0.5 Cc. of the fluidextract of buchu, but does not, as on addition of the fluidextract to the elixir a considerable amount of precipitate is formed, which, in accordance with the N. F. directions, is unceremoniously filtered out, even though, by doing so, the therapeutic activity of the preparation is reduced to an unknown degree. If iso-alcoholic elixir were used—in this case the alcoholic aromatic elixir—the fluidextract would be mixable with it, giving a clear preparation of definite relation to the activity of the drug it represents. However, even then the preparation would be quite feeble. Each teaspoonful would contain only one-fourth of the average dose, which is 2 Cc. Each teaspoonful could easily carry the latter dose, if iso-alcoholic elixir were used. It would be of advantage to the popularity of the N. F. elixirs among physicians, if they knew that each teaspoonful of the medicated elixirs contained a medicinal dose,[1] and if they realized that each of the medicated

[1] H. C. Wood, "Elixirs of the National Formulary," JOUR. A. PH. A., 7, 344, 1918.

elixirs is as pleasant a liquid administration form of the respective medicament as the combined skill of American pharmacists can devise.

Another good example in point is the *elixir of terpin hydrate*, N. F., which at present contains only 0.065 Gm. of terpin hydrate per teaspoonful; and that is all that will possibly dissolve in our present elixir. There is no difficulty experienced on dissolving in a teaspoonful of the alcoholic elixir 0.25 Gm. of terpin hydrate, which is the U. S. P. average dose for this drug. Pleas from medical men have reached the N. F. Revision Committee that the dose of terpin hydrate in the elixir be increased. The plan proposed would be the simplest way of doing this.

ELIXIRS CONTAINING SALINES.

The saline elixirs, as a general proposition, are far from being palatable. That alcohol accentuates the saline taste and makes it more unpleasant is shown by a comparison of the official *elixir of sodium bromide* (containing 25 percent alcohol), with one containing only 5 percent, and identical in every other respect. However, it seems to us that the aqueous elixir of glycyrrhiza has a superior disguising value for most of the salines; and we advocate that the formulas of the following elixirs be changed by using the aqueous elixir of glycyrrhiza instead of the aromatic elixir, as the resulting preparations are much more palatable:

Elixir of sodium bromide,
Elixir of potassium bromide,
Elixir of sodium salicylate.

There are, no doubt, a number of others that might be thus improved.

On the other hand, we find that the *elixir of potassium acetate*, made with the compound elixir of almond as a vehicle, is decidedly more palatable than one made with the aromatic elixir, as now official, or with the aqueous elixir of glycyrrhiza. We have here a good example of the necessity for individual study of each one of the medicated elixirs.

ELIXIRS CONTAINING BITTER DRUGS.

It takes but little experimentation to show that the elixirs containing bitter drugs could be improved upon. Take the *elixir of cinchona alkaloids*, for example. It is disagreeably and persistently bitter. To find the best vehicle for this elixir, we added the medicating alkaloids in proper amount to each of the vehicle elixirs, with the result that the most palatable ones were the preparations made with the aqueous elixir of glycyrrhiza and the aromatic elixir of eriodictyon. Unfortunately, both were turbid mixtures. By modifying the elixir of eriodictyon in the manner previously described, we obtained a preparation of the cinchona alkaloids that in appearance is the equal of, and in taste much superior to, the elixir at present official.

The *elixir of iron, quinine and strychnine* is used so extensively that it is commonly spoken of as "elixir of I. Q. S." It may be that its elegant appearance has something to do with its popularity. It surely cannot be its taste, which is intensely and horribly bitter. Time and again have patients expressed their disappointment at the nasty taste of the beautiful green medicine. We must confess our inability to improve this elixir. The elixir of eriodictyon, as well as the elixir of glycyrrhiza, fails us when it comes to the disguising of strychnine. In

our opinion, the iron, quinine and strychnine combination had best be given in solid dosage form; to inflict it upon a patient in liquid form is, to say the least, unkind.

We realize that the work described has merely scratched the surface of the problems presented by the elixirs. However, a scratch is all that is required to make glass break easily. Our hopes would be completely realized should we succeed in breaking the placid surface of indifference in this matter, and in arousing criticism and experimentation, so that we may finally present to our patients their medicines in the most elegant form possible.

DRUG STORE MANAGEMENT.*

BY H. L. GUFFIN.

This is a subject which covers a great latitude inasmuch as different types of stores require different forms of management. We have the professional or so-called ethical drug store which caters to and depends upon the medical profession for its patronage and handles for sale only such articles as are relative to the prescriptions and physicians' orders. Secondly, we have what might be called the semi-professional store, which, I imagine, comprises the great majority of drug stores, catering both to physicians and laity, deriving revenue not only through their prescription department, but also from sale of soda water, cigars, sundries, etc. The third type of drug store is the purely merchandising store which caters not at all to the medical profession and depends altogether on its advertising ability and location to bring customers in sufficient numbers to insure a large turnover of merchandise. Location and class of patrons settles the question as to what type of store should be operated and the method of management is designated by type of store.

In all forms of administration there are three elements which are always present; planning, giving orders and supervision. Organizing a business is very much like organizing an army in that plans of operations must be thought out in advance by the executives of the business and orders given to employees. From that point it is merely a case of supervision or improving of tactics. I do not mean that the executives of a business should do all the thinking—because I am well aware of the fact that the first step in the successful handling of men is to provide opportunity for the display of ambition and for the development of ability. Too much strict discipline is sometimes a fault. Discipline that stifles ambition, that chokes initiative, that shuts out confidence and affection eventually destroys the business in which it is employed. To be sure there must be discipline in every business, for the same reason that there must be a head to every business. No matter how many or how few employees there are in a store, they should be so graded that at all times there is a leader on hand, someone who takes the place of the proprietor or manager during his absence and assumes the responsibility of running the store.

Let us consider a well-stocked store with a satisfactory force of employees. I will endeavor to outline the operations under the following heads:

*Read before Detroit Branch A. Ph. A., February meeting, 1921.