We cannot separate education and democracy. Education is the foundation-stone of democracy. Our schools must not only prepare the individual to live but to live more abundantly, in every sense of the word. Since a democracy is a great community of mutual interests and responsibilities we agree with Allengry,[4] who says, "It is important, therefore, to constantly increase the intellectual capital of the nation, to train up citizens who will be above selfish considerations, to develop a political sense which will subordinate private interests to the general good, to engender a sense of duty, and to create great moral forces which are the sole guarantee against slavery and demagogism." The problem of education is much bigger than the individual and his trade or profession, it is as big as society itself. If the leading educators of the country are expecting the schools to make it a part of their business to develop a sincere moral intelligence, create a great national character and establish adequate standards of ethical ideals, we, who have the highest success for pharmacy at heart, must take cognizance of the situation. We may need to forsake the old way for the new, but progress in education means that it is dynamic and not static, that "Contentment is death" to pharmaceutical education as it is to every other field of education.

BIBLIOGRAPHY.

1. "Learning and Doing"—Swift, chapters 2, 3 and 7.
2. "Educating toward Democracy"—Voorhees, Education, Nov. 1919.
3. "Problems of Educational Readjustment"—Snedden, chapters 1, 2 and 3.
4. "French Ideals of Today"—Buisson and Farrington (F. Allengry, chapter 3).
5. "Democracy and Education"—Dewey, chapters 2, 6, 7, 23 and 26.
6. "Education and the New Democracy"—Thaler, *Ed. Rev.*, January 1920.
7. "Educational Aims and Educational Value"—Hanus, chapter 1.
8. "Schools of Tomorrow"—Dewey, chapters 9, 10 and 11.

PURDUE UNIVERSITY SCHOOL OF PHARMACY.

WHY CASTILE SOAP SHOULD BE DROPPED FROM THE PHARMACOPOEIA.*

BY E. V. KYSER.**

At the meeting of the American Pharmaceutical Association held in New York last year I presented a note "Proposed Changes in the Soaps of the Pharmacopoeia,"† suggesting that the definition of Soap in the Pharmacopoeia be changed so as to conform to the standards adopted by the United States Bureau of Standards. This would do away with the recognition of olive oil soap and would eliminate the use of the word "Castile soap" as a synonym for the official soap.

This proposal was referred to the Committee on Revision.

Since that time an importer of Castile soap has published an article on the subject in which he attempts to refute the arguments which I put forth in the paper referred to, and to create the impression in the mind of the reader that the retention of the present definition of Soap in the Pharmacopoeia was necessary

* Read before Scientific Section, A. Ph. A., City of Washington meeting, 1920.

** The author acknowledges the valuable assistance of Caswell A. Mayo in the preparation of the paper.

† JOUR. A. PH. A., October 1919, p. 813.

to safeguard the interest of the public, and would protect them from the impositions of the American manufacturers.

I wish to present the subject again from a somewhat different point of view and to rehearse some of the arguments which seem to me quite sufficient to justify the Committee on Revision in adopting the standards for soap provided by the United States Bureau of Standards. The adoption by the Pharmacopoeia of an olive oil soap including its synonym Castile, would make it appear to the medical profession and to the general public that such a soap is not only superior to other soaps, but that it possesses some peculiar therapeutic value. This is in no way true; there is no difference in the therapeutic value of soaps, providing, of course, that the soaps have the same moisture content, are free from foreign matter and tendency toward decomposition.

With respect to their energy as germicides, soap solutions differ but little. All can be used as disinfectants in cases where they can be employed to advantage. The writer has recommended[1] that the Committee on the Revision of the Pharmacopoeia should replace the present *Sapo* with one made from a base of 80 percent prime tallow, and 20 percent Cochin grade cocoanut oil and that the proposed soap shall comply with the United States Government standards of purity as given by the Bureau of Standards for a milled soap made by the boiled process. Furthermore, the writer suggests that the requirements for *Sapo* be made more rigid and the methods of analysis be more explicit than at present. Such a soap is better suited, chemically and physically, for pharmaceutical requirements and general use, when economy, stability, chemical and physical superiority are to be considered.

Soaps are defined as metallic, alkaline or alkaline earth salts of fatty acids. We are interested here in the sodium or so-called hard soap. The manufacture of soap is a comparatively simple process, which no doubt had its inception in the household.

The devised method of making caustic soda by causticising sodium carbonate, derived from salt, by LeBlanc in 1871, and the invention of the ammonia soda process by Solvay, in 1863, were the prime factors in the development of commercial soap manufacture.

The processes of soap-making, with their limited variations, in use, are the "cold," "semi-boiled" and "boiled" processes.[2]

The cold process is merely mixing the fat and alkali while cold, until saponification is started. The heat evolved from the chemical reaction completes the saponification.

The semi-boiled method is a modified cold process using a higher temperature. Here the saponification is either effected in a kettle or mixer.

These two processes are open to the objection that foreign matter (contained in the fats or lye) is retained in the soap and, moreover, at times it is not possible to completely saponify the fat. Such soaps not infrequently contain free fat, or free alkali, or both. It will be readily understood that the action of the lye on the stock is necessarily less complete in this case (semi-boiled) than in the process of making soap by boiling; and, that the product will contain some uncombined ingredients besides all the impurities that may have been present in the stock and lye.[3]

In both of these processes, *viz.*, cold and semi-boiled, no separation of soap is effected, and the soap contains the glycerin and any impurities present in the oils. The saponification is also frequently incomplete.[4] Unlike the milled soaps made by the boiled process, these soaps all contain a very large percentage of water. The Pharmacopoeia allows 36 percent of water in bar Castile soap, and 10 percent in powdered. Soaps made from unsaturated glycerides and containing a large amount of water are deceptive to the buyer; by use, they waste away rapidly, become unsightly, decompose and are far from sweet-smelling.

Of these the boiled, also known as grained or settled process, is the only perfect method of completely saponifying the fats as well as separating the soap from the foreign or unsaponifiable matter, invariably found in fats and lye. Briefly, the boiling process consists of boiling the fat with alkali; adding salt until the soap is separated or rendered insoluble; and withdrawing the aqueous portion known as the waste lye. This operation is known as the stock change. The soap is again boiled with a strong solution of lye to insure complete saponification. A strong alkali acts the same as salt on the soap, and the aqueous solution of excess lye is withdrawn. This is known as the strong change. The soap, now ready for finishing, is boiled up with water and salt; then it is allowed to settle for two days. The clear soap rising to the top is completely saponified and free from alkali and foreign matter. This method is used exclusively in the manufacture of the finest grades of milled soaps for toilet and medicinal use. While this process is necessarily more expensive than the semi-boiled or cold processes, the finished soap warrants the expenditure. It is only by the various operations, made possible by boiling, that the glycerin formed in the course of saponification, the excess of lye, and numerous impurities contained in the fats and lye can be removed; the consequence of this is that well-boiled soaps—made neutral and freed from foreign matter—wash away less rapidly than do the cold-made, or half-boiled soaps, and do not become rancid in time by the presence of free fat.[5]

The oldest and probably still the best method of soap-making is the boiling process in which the fats are boiled together with alkali and the resulting soap is separated from most of the liquid which contains glycerol and impurities.[6]

The process of milling consists of passing the dried soap chips repeatedly through stone roller mills. The soap is thoroughly mixed, freed from excess moisture, made more compact, and its texture improved. Soaps of this kind constitute nearly ninety percent of all the soaps used for toilet and medicinal purposes. Soaps intended to be milled may be made by either the cold or the semi-boiled process, but for the best results, *viz.*, perfect saponification, neutrality and purity, the grained settled process is best. Only the best stock available is used for a milled soap base.[7] Of all the soaps made, those prepared by "milling" are the best in many respects. In point of intrinsic merit as a soap they are preferred because they contain the least possible amount of water, and are usually made from the best of materials, and with the greatest of care; besides, every well-made soap is improved by repeatedly re-working it. They are also more lasting in use because their small proportion of moisture and their dense texture make them waste away less quickly. In appearance also, which is not an unimportant item in a toilet soap, they are beyond comparison, for the process by which they

are manufactured gives them a high finish and preserves them from shrinking, no matter how long they are kept.[8]

Chemically there is no material difference between oils and fats used in soap-making; both classes as we know them are mixed glyceryl esters of fatty acids. For convenience, the word fat will be used, in reference to oils and fats. The largest number of fats contain: olein, palmitin, and stearin in varying amounts, whereas olein, palmitin, or stearin are present in all fats in some proportion. Fats containing a large percentage of the saturated glycerides, stearin, and palmitin, *viz.*, tallow, palm oil and cocoa butter, are solids at ordinary temperature, whereas fats composed of a greater percentage of the partially or completely unsaturated glycerides, olein, linolin, and linolinin, *viz.*, olive, corn, soya, peanut, linseed, are liquids at ordinary temperature.

The three methods of obtaining fats are, rendering, expression and extraction:

Rendering, which is extensively used for fats of animal origin, may be effected by open fire heating or carried on in closed vessels, using live or dry steam. In both methods, the fat capsules are expanded by the heat until they are ruptured, allowing the liberated fat to run off and be settled.

Expression, either cold or hot, is used almost entirely in producing vegetable fats.

Extraction, which produces a larger yield of fat, was formerly not used to any extent except in the recovery of off-grade fats. This method with the improved facilities for the recovery of the solvent, thereby leaving the oil and the cake in an edible state, is becoming very popular, and, by its economy and ease of operation, will most likely supplant other methods. To produce the best fats by this method, the material to be extracted should be in a fresh state, as the solvents used have a tendency to extract any products of decomposition and coloring matter present.

Olive oil is obtained from the fleshy part of the fruit of *Olea Europoea*. The Pharmacopoeia directs that it be made from ripe olives. The best oils are obtained from the olives just before maturity; the yield is not as large, but the quality of the oil is superior to that from the mature or ripe fruit. The olive tree is indigenous to western Asia, and has been transplanted into all of the countries bordering on the Mediterranean, as well as South Africa, Australia and California. The quality of the oil depends on the variety of the tree, the time and method of gathering, and the method of making. There are some three thousand varieties of trees in Italy alone, each producing its characteristic oil. At the harvest time there is such an abundance of olives that it is not possible to express all, while fresh. This necessitated storage in different ways, among these are salting, submersion in cold water, and keeping in dry, well-ventilated houses. Olives decompose readily, and consequently, if kept for any length of time, generally produce oils of high acid value and rancidity.

It is generally believed that Castile soaps are made from the high-grade oils. This is a mistaken idea, for Castile soaps are made from the oils that are not fit for edible use. The oil from the first cold expression is the edible or virgin oil. The second cold expression produces the salad oils, which are sold as edible, or else mixed with the edible oils. After the cold expressions, the cake is removed,

treated with hot water, and again expressed, either once or twice, producing the bright oils, known as Commercial Grade, which are used for lubricating, burning and some soap-making. The repeatedly pressed cake contains a further amount of oil and consequently it is removed and treated in a special water mill, whereby the cells are broken up. The mass is run into tierces, the oil and tissue rising to the top is skimmed off and expressed. The oil here obtained is settled; the lighter portion is known as *huile claire de ressence*, the lower layer of heavy oil "olive grease." These oils are high in acid, oxidized and contain lactones.

In some instances the marc or cake, after several expressions, is thrown into pits and allowed to ferment, after which it is treated with hot water and expressed. The "bagassa oils," which are obtained in this manner, are high in acids and oxidized. When all of the oil is obtained by the process described, the pulp is extracted with carbon disulphide, hence the sulpho-carbon oils which are green in color, due to the extraction of chlorophyl, are highly contaminated with organic impurities. The lower quality oils are used in the arts, as burning oils, lubricating oils, wool and soap oils. For textile soaps (as also for household soaps in the south of Europe) the highly acid bagassa oils, olive oil grease, and sulphur oils are used. High-class medicinal soaps are chiefly made from the best commercial oils. Olive grease and sulphur oils are used for the marbled Castile and the green Marseilles Castile.[9] Castile soap, otherwise known as Marseilles or Venetian soap, is prepared from low-grade olive oils.[10] A soap made from any of the enumerated oils can be called Castile, which is the adopted synonym for *Sapo* by the Pharmacopoeia, and sold as such to the laity with immunity, because these soaps are made from caustic soda and olive oil. If the Pharmacopoeia is to retain this inferior soap, it should at least protect the users by a more specific analysis for purity. The present analysis is totally inadequate inasmuch as other soaps made from similar oils could replace olive oil, and respond to and comply with the present specifications. The Pharmacopoeia states that 0.67 Gm. of soap dissolved in 25 Cc. of alcohol should not gelatinize when cooled to 20° C. This is given as a test for soaps from animal fats. This test would indicate that soaps made from palm oil,

Oil.	Sp. gr. 15° C.	Sapon. value. Mg. KOH.	Iodine No. Percent.	Titer test fatty acid.	Insoluble organic.	% liquid solid acid.
Olive.....	0.9–0.916	185–203	78–94	18.9–26.4° C.	0.46–1.42	Solid acid 5–17. Liquid acid oleic
Olive Kernel..	0.9184–0.9191	182.3–183.8	86.9–87.8	.....	.....	
Almond.....	0.918–0.919	189.5–191.7	93–101.2	.....	.....	
Archidic Peanut.....	0.913–0.917	185.6–196	83.3–95.4	28.1–29.2	0.2–0.79	Solid acid 5 Liquid olcic and linoleic
Cottonseed....	0.925–0.925	191–194	100–120	28–35	.....	Solid 20–25 Liquid oleic Linoleic
Lard.....	0.916	189–193	67.88	19–23	.....	Solid 5 Liquid olcic
Tallow.....	0.943	143–198	35–40	43–44	0.2–0.3	Solid palmitic stearic Liquid oleic
Cocoanut.....	0.930	250–260	9.3	21–25	.....	

Japanese vegetable tallow, or hydrogenated oils, including olive, do contain animal fats. There is no test for benzol-soluble unsaponified matter, with saponifiable, free fat, or for the unsaponifiable organic impurities. The iodine number is the only test which would in any way indicate the origin of the soap and here we have other vegetable as well as animal fats, whose iodine numbers are between 84 and 90.

Chemically, olive oil is a non-drying oil. In this class are almond, peanut, olive kernel, and many others of lesser importance. For comparison, lard oil, cottonseed oil, cocoanut oil and tallow are included in this chart.

From the above chart it can be seen that the chemical composition of the unsaturated oil does not vary greatly, with the exception of cocoanut oil, which is nearly a saturated oil. The most striking similarity is the chemical composition and the constants of olive and lard oils. Therefore it can readily be understood that soaps made from any of these oils would be chemically the same and would exhibit the same physical and therapeutic properties.

None of these oils, when used alone, are chemically or physically suited for the manufacture of soaps for the toilet or medicinal use. They are susceptible to oxidation as evidenced by their iodine numbers, and consequently become rancid, ill smelling and unsightly.

The writer has recently had occasion to examine a number of Castile soaps and he finds these conditions to be generally evident. A most striking incident of rapid decomposition was manifest in a well-made imported "white Castile." This soap, protected by a waxed paper and a tinfoil wrapper, was exposed to the air for sixty days. At the expiration of this time, the soap had lost 25 per cent in weight (water), was of a dirty brown color, and had developed a very offensive odor of decomposition.

Castile soaps, while they do not lather very well, waste more rapidly than do soaps made from a tallow and cocoanut oil base. The percentage of water present, the method of manufacture, and the large amount of sodium oleate, all contribute to these objectionable characteristics.

The true Castile soap, as may be readily expected, becomes very hard with age, and forms a slimy mixture with water, rather than a lather.[11] Castile soap may be imitated by the use of peanut oil, cottonseed oil and light red oil. Tallow may be used in varying amounts up to the degree that the characteristic slimy lather of soap made from olive stock is not destroyed.[12]

Soaps made from fats containing a large amount of olein are of a softer body and more readily soluble in cold water than soaps of a firmer stock, *viz.*, tallow. Unbleached olive foots yield a green soap, but this color sometimes changes to a dirty brown. In warm weather this soap softens considerably and washes away very rapidly.[13] A large amount of water present causes the soap to be used up very rapidly.[14] There is required, for the proper formation of soap, a certain percentage of water which enables the particles of soap to form a compact and yet readily soluble mass. Other things being equal, the soap is more easily soluble, and thereby more rapidly effective, in the proportion that it contains a greater percentage of water. This proportion, of course, must be within reasonable limits in the product to be marketed, as an excessive amount would be in the nature of a deception from the purchaser's standpoint, besides the subsequent evaporation renders the soap unsightly and too light in weight. Freshly made soap washes

quickly, but is apt to waste away in consequence of its greater solubility on which this rapid action depends. The amount of water contained in commercial hard soaps including that only admixed and that bound chemically, varies greatly, say from 10 to 12 percent to 35 or 40 percent.[15]

SUMMARY.

Castile soap, even if made from the best grade edible olive oil (which it is not), does not possess any peculiar therapeutic value. Soaps made from any fat containing a large percentage of unsaturated glycerides, *viz.*, lard, olive, soya bean, cottonseed, peanut, linseed or even red oil, will exhibit the same physical and chemical properties and therapeutic effect.

The method of manufacture used for Castile soap is open to the objection of incomplete saponification, the retention of impurities and a large percentage of water.

Castile soap is not a good detergent, does not lather well, and is deceptive because it contains from 25 to 36 percent of moisture and is not made from U. S. P. olive oils.

Soaps made from other oils than olive oil will comply with the analytical tests of the Pharmacopoeia and will function the same as olive oil soaps. Castile soap is not economical to use; it wastes away rapidly—due to its high moisture content, its composition, as well as the method of manufacture.

If soap be made from the materials by the method of manufacture herein proposed, the resultant soap will be the best obtainable soap for any use, whether it be medicinal or domestic.

Such a soap as proposed is absolutely pure, mild, emollient, free from unsaponified fat, alkali or foreign matter, and is permanent.

It possesses better lathering properties than does Castile soap, is an effective detergent, and more economical in use.

Moreover, if the standards which I have proposed be adopted in the Pharmacopoeia, the soap can be made by American manufacturers from American raw material by the standardized American process. The resulting soap will be a purer, better and more economical soap than is Castile soap. As a matter of fact, the question has been raised whether soap should be recognized at all in the Pharmacopoeia. The Department of Agriculture does not appear to consider Castile soap as being a medicinal article, since it has not made any wide-spread campaign of prosecution against manufacturers, who have marketed soap under this name, which did not conform to the Pharmacopoeial requirements.

Some State authorities, however, have undertaken such prosecutions and, in one instance at least, the charges were dismissed by the court on the ground that the substance was not a "medicinal substance," but was a toilet preparation, and that it was not in the province of the Drug Act to supervise its composition.

I have no sympathy with those who sell as Castile soap any soap other than that made from olive oil. I think that the term "Castile Soap" should be used solely as a descriptive term applied to olive oil soap, but I am strongly of the opinion that the retention of the term "Castile Soap" in the Pharmacopoeia, and the directions to use olive oil soap, would be a grave mistake both from a commercial and from a scientific standpoint, as both the medical profession and the general public would assume, as it has been assumed in the past, that because a particular soap was recognized in the Pharmacopoeia it was the best soap, whereas on account of the peculiar physical qualities of Castile soap and of the method of its preparation it is not the best soap for general use, nor has it any special, physical or therapeutic value; but, on the other hand, it is apt to have an excess of water and may contain impurities which are not excluded by pharmacopoeial tests.

BIBLIOGRAPHY.

1. "Proposed Changes in the Soaps of the Pharmacopoeia," E. V. Kyser. JOUR. A. PH. A., 8, 813, 1919. *Druggists Circular*, Vol. 23, No. 12, page 531.

2. "Modern Soaps, Candles and Glycerin," Lamborn, page 374.

3. "American Soaps," Gathmann, page 258.

4. *Circular of Bureau of Standards*, No. 62, page 6.
5. "American Soaps," Gathmann, page 182.
6. *Circular of Bureau of Standards*, No. 62, page 6.
7. "Modern Soaps, Candles and Glycerin," Lamborn, page 356.
8. "American Soaps," Gathmann, page 303.
9. "Chemical Technology and Analysis of Oils, Fats and Waxes," Lewkowitsch, Vol. II, page 367.
10. *Circular of the Bureau of Standards*, No. 62, page 7.
11. "American Soaps," Gathmann, page 208.
12. "Modern Soaps, Candles and Glycerin," Lamborn, page 318.
13. "American Soaps," Gathmann, page 57.
14. *Circular of Bureau of Standards*, No. 62, page 10.
15. "American Soaps," Gathmann, page 26.

SUGGESTIONS TO THE U. S. P. REVISION COMMITTEE.*

BY WILLIAM GRAY.

SAPO MOLLIS.

Soft Soap should be made from corn oil because all large soap-makers use this product. Experience has taught them that soap made from corn oil has a better appearance; is more stable than that made from cottonseed oil. The latter requires more alkali for saponification, becomes rancid quickly, if neutral, also discolors readily; so why not use the article professional soap-makers find to be the best, as most druggists do not make the soap? They either buy the corn oil product, or pay a premium for the cottonseed oil soap—a product, manufacturers inform me, they do not care to make, for reasons stated above. I might add, if there is a desire for economy, the best way would be to leave it open to use any vegetable oil, for example, peanut, soy bean, linseed, etc. There is a very great fluctuation in price of oils throughout the year; this would allow the soap-maker to use the cheapest at time of manufacture, thereby reducing the cost to purchaser.

LIQUOR CRESOLIS COMPOSITUS.

The Compound Solution of Cresol formula should be simplified so that the average pharmacist will take the trouble to make this preparation. This could be accomplished by using equal parts by weight of cresol and soft soap. The pharmacist would be surer of perfect saponification than is the case with the present formula, because both oil and alkali will vary; the alkali in anhydrous properties, requiring titration or the use of hydrometer; the oil in saponification value, due to age or source. Would it not be a great advantage to the pharmacist to use a previously made soap?

UNGUENTUM ZINCI OXIDI.

The present formula for Zinc Oxide Ointment is not generally desired, so far as I have been able to observe, because often it will be found rancid. Generally speaking, zinc oxide ointment is used as a protective—why not use petrolatum as the base? It is common practice, so let us make it official:

* Read before Section on Practical Pharmacy and Dispensing, A. Ph. A., City of Washington meeting, 1920.