

agitation, until it becomes clear. Lastly add the oil of lavender flowers and mix thoroughly.

By comparing this formula with that of Liquid Petrolatum Saponatum now in the N. F. the substitution of stronger ammonia water for spirit of ammonia will be noted. This is undoubtedly a wise change, when we consider that the ordinary drug store does not usually have spirit of ammonia upon its shelves. Or when it has, it is deficient in strength.

The mode of preparation may, however, be improved upon. By following the above instructions, a clear mixture is produced within five minutes after placing on a water bath. But on cooling it frequently separates into two layers. In the writer's experience this happened three times in succession.

Uniform results may be rapidly obtained when we proceed as follows:

To the oleic acid contained in a flask, add the stronger ammonia water, and alcohol which have previously been mixed. Shake well, and when completely saponified, add the liquid petrolatum and oil of lavender flowers. Mix thoroughly by shaking.

CORK.*

ITS HISTORY, ORIGIN AND MANUFACTURE.

OTTO RAUBENHEIMER, PH. G.,

The writing and reading of a paper on Cork may seem trivial to a great many, but I have been prompted to undertake this task for the following two reasons:

1. The average pharmacist, who uses corks daily and considerably, has but very little knowledge of the source and manufacture of that necessary commodity.
2. The books in English, especially the books available to the pharmacist, f. i., those on pharmacy and botany, and also the dispensaries, have nothing or but very little to say as to the history, origin, and manufacture of cork. Through an introduction to the owners of one of our large cork factories in Brooklyn I had the good fortune of visiting their plant in operation, thus obtaining a great deal of practical knowledge.

Just as the venerable oak, the monarch of the trees, the patriarch of the forests, has been known from times immemorial and its bark has been used in tanning, so another species, the cork oak, has been well known to the ancients and five of the chief properties of its bark were known and utilized 2000 years ago.

Theophrastos, 400 B. C., the father and founder of botany, describes the cork oak in his great work, *Historia Plantarum*. He calls the tree "phellos," and gives its habitat as the Pyrenees, and also describes two varieties, one an evergreen, our present *Quercus suber*, L., the other losing its leaves in the winter, our present *Quercus occidentalis*, Gay. Theophrastos also states that "phellos" produces a thick, fleshy bark, which when stripped off will grow again and makes

*Read and demonstrated with specimens at the March meetings of the New York Branch of the A. Ph. A. and the Kings County Pharmaceutical Society.

the tree more vigorous. This bark is so light that it never sinks in water and is therefore used for a variety of purposes.

At the time of the early Roman empire, cork must have been used to close wine vessels, because the poet Horace, about 25 B. C., speaks of removing the *cork sealed with pitch* from a jar of wine 46 years old.

Pliny, 50 B. C., the great Roman historian, in his wonderful work, "Historiæ Naturalis," written in the first century of the Christian era, corroborates the statements made by Theophrastos. In describing the tree he also remarks that the acorns are bitter and of the worst quality. He names the cork "Suber" and mentions the following uses for it:

1. As floats for the nets of fishermen. This especially is shown in the case of the drag-nets, where the upper edge of the net should be kept at the surface of the water.

2. As buoys for ships' anchors. They were called "ancoralia," and by being attached to the anchor rope floated on the surface of the water and indicated the position of the anchor. These buoys also served to attach smaller boats when in the harbor. Inasmuch as today blocks of wood or empty casks are used for this purpose, the Dutch sailors originated their proverb, "He has a head like a buoy," that is, a "block head."

3. As soles or insoles for shoes, in order to secure dry feet, especially in the winter, and as high heels were not in vogue at that time, the Roman ladies, who wished to appear taller than they had been formed by nature, put plenty of cork under their feet.

Marcus Terentius Varro (died 27 B. C.), a contemporary of Cicero and Caesar, the great Roman polyhistorian, in his work "De Re Rustica," speaks of cork or suber as a non-conductor of heat.

Lucius Junius Moderatus Columella, the celebrated Roman agronomist, often called the father of agriculture, in his book, an authority on the cultivation of medicinal plants, 60 A. D., speaks of the uses of cork, which he names "Cortex" or "Suber" and recommends it for beehives.

Plutarch (born 50 A. D.), the great Roman historian and biographer, in Vita Camilli, informs us of another use of cork, namely,

4. As jackets or life-preservers. He states that the Roman whom Carmillus sent to the capitol when it was besieged by the Gauls, put on a light dress and put cork around his chest and thus succeeded in swimming through the Tiber.

Isidorus Hispalensis (570-636), bishop of Sevilla and last historian of the Roman Empire, in his great work, Etymologiarum, says under "De Re Rustica" that cork is used to facilitate swimming.

If besides these four uses of cork we add the fifth, namely, as stoppers, as pointed out before, then we can readily see that the five principle functions of cork of today were already recognized 2000 years ago.

The Origin of Cork Stoppers.—This use is perhaps most important especially to the pharmacist, being the most extensive and principal use of cork at present. This was not entirely unknown to the ancients as it is mentioned by Horace, Pliny and Cato. Nevertheless the use of cork stoppers could not have been very common, because the works on agriculture and cookery do not mention the same, but

directed the containers to be sealed with clay or pitch, etc. As Italy produced little timber, consequently casks were but little used and had to be brought from the district of the Alps. The wine was kept in the *Apotheca vini*, or special wine cellar, in large earthen vessels with wide mouths, and sealed with clay, pitch or parchment, or the air was kept away by a layer of olive oil. From these the wine for daily consumption was drawn into smaller vessels, as pitchers or jars or bottles which could be stoppered with cork. The Romans had principally two kinds of bottles, the "lagenæ" with a long neck and the "ampullæ" with a short neck, but there is but very little proof that these bottles were used for wine and were stoppered with cork. It was customary to add a layer of oil to exclude the air.

Saladin of Ascolo or "Asculanus," the celebrated "Artium et Medicinæ Doctor," in the middle of the fifteenth century, in his "Compendium Aromatariorum," the first book on the practice of pharmacy, does not mention corks but states in the seventh chapter that the vessels were stoppered with pitch or wax. This troublesome and also expensive method lasted until the end of the seventeenth century, when it was replaced in the German Apothecary shops by cork.

In the champagne industry carried on in the monasteries corks naturally became a necessity and credit is given to Dom. Perignon in Epernay, France, for the invention of bottle corks, at least for champagne bottles.

Even today the champagne corks are cut by hand and not by machinery. How the cork industry developed can be seen from the following records. In 1781 the spring of Niederselters, which even to the present day puts up its carbonic water in earthen jugs and not bottles, used 2,208,000 corks, which cost 4 florins per thousand. These were supplied by a merchant at Strasburg, who was supposed to take back the old corks which he cut into smaller stoppers. It is also stated that the demand for smaller corks in the apothecary shops was but very limited.

Synonyms.—Lat.: *Suber*, *Suber Quercinum*, *Cortex Suberis*, *Lignum Stberinum*.

Eng.: Cork, Corkwood.

Spanish: Corcha.

German: Kork.

French: Liège, Chêne-liège.

Etymology.—The name "Quercus" is derived from the Celtic "quer" = nice, and "cuez" = tree, indicating the beauty of that venerable tree. "Suber" is from the Latin "sub" = under, from its use as soles on shoes.

The English word "cork," and the German "Kork" are undoubtedly derived from the Spanish "Corcha," which again comes from the Latin "Cortex." "Cortex," the bark, is a corruption of "Contex" from "Contego" = to cover, which again is derived from "Cum" = with, and "tectum" = roof or cover.

The French "liège" is derived from the Latin "levis" = light, from the property of cork. In order to avoid any misunderstanding I might also mention here, that Cork, the city of Ireland, did not receive its name from the cork oak, which does not grow in the northern climate, nor from the manufacture of corks, but from the fact of being located on a former *swamp*, which in Celtic is called "*Corroch*."

Source and Habitat.—Cork is derived commercially from the cork oak, prin-

cipally from *Quercus suber* L., an evergreen tree, and to a smaller extent from *Quercus occidentalis*, Gay, which loses its leaves yearly, as already described by Theophrastos. The trees are usually from 20 to 40 and sometimes 60 feet high, and measure 3 to 5 feet in diameter and attain an age of about 2000 years. The wide spreading branches are generally thinly covered with small leaves which are thick, glossy, slightly serrated and downy underneath. The tree flowers during April or May and the yellowish flowers are succeeded by small acorns, which when fed to pigs give their meat a peculiar piquant flavor, which has given a reputation to the Spanish mountain hams.

The cork oak is a native of the countries bordering on the Mediterranean Sea, especially Spain, Portugal, Algiers, and Tunis (Morocco). It requires a temperature of 13° C., and does not thrive beyond 45° latitude. The cork producing territory covers practically all of Portugal and part of Spain, namely Andalusia and Estremadura in the South and Catalonia in the North. The total area covered by cork forests is estimated at about five million acres and the annual production of cork wood is said to be about fifty thousand tons. Some of the very best bark is made into corks in Portugal and Spain, especially in Catalonia, but most of it is exported as corkwood to the United States, England, Germany, Austria, etc. The principal shipping port is Sevilla. France obtains a great deal of corkwood from Algeria.

Cultivation of the Cork Oak.—The preservation and cultivation of the cork trees has been attempted and practiced for some time especially in the southern part of France and Algeria. As early as 1859 a French work was written by Rousset: "Culture exploitation et management du chêne-liège en France et en Algérie." The United States Government in 1858 distributed seedlings and I am informed that in the southern and southwestern section, cork oaks are now growing which in time will furnish cork.

Formation of Cork.—The bark of the cork oak is covered with an epidermis up to its third year, which then bursts lengthwise owing to the growth of the corky layer underneath. The formation of the cork or dead cells or peridermis is done by the inner layer, the cambium, and continues regularly. When the tree is about fifteen to twenty years old it has a diameter of about five inches, or to be more correct, measures forty centimeters, according to the Spanish Government regulations, then the so-called male cork or virgin cork is removed for the first time. This is of very little commercial value, being rough and coarse in texture. The removal of this virgin cork, however, promotes the further development of cork, because the inner bark, or cambium, the so-called mother-cork, undertakes at once the formation of a new covering of much finer texture and elasticity. The cambium with its life-giving sap, forms two layers of cells each year, one within, which increases the diameter of the trunk, and the other without, which adds thickness to the cork. In about eight to ten years, the cork layer becomes about 17 to 26 mm. thick and is then removed. This so-called female cork is more valuable than the virgin cork but is not as fine in quality as the third and subsequent strippings which follow at regular intervals of eight to ten years. The cork oak furnishes the very best quality of cork at the age of fifty to one hundred years; when the tree becomes 150 years old the quality of the cork gets poorer.

Collection of Cork.—This is performed by stripping it off the tree, using great care not to injure the cambium, in which case a reddish liquid will ooze out and no more cork will be formed at that part of the tree. The peeling is done from May to August in Algeria and during July and August in Spain and Portugal. The French in Algeria sometimes use saws, but the Spaniards employ hatchets with long wedge-shaped handles. The bark is cut around the trunk and the branches in several parallel places and the two incisions are then connected by several longitudinal cuts, following as much as possible the deepest of the natural cracks in the bark. By inserting the wedge-shaped handle of the hatchet, the cork is then detached. The thickness of the bark is from one-half to two and one-half inches and the yield varies according to the size and age of the tree from fifty to five hundred pounds. The gathered bark is next removed to the stations where it is put into boiling water in order to soften the cork so the outer bark can be scraped off. This process reduces the weight of the cork almost 20 per cent. The boiling also extracts the tannic acid and increases the volume about 30 per cent. Being now soft and pliable, the bark is flattened and is packed and pressed into bales bound securely with steel bands.

These bales weigh uniformly 106 kilos, or about 224 pounds, so ten of them make an English gross ton.

Manufacture of Corks.—Corks in olden times were of course made by hand, using a very sharp knife. This method is still practiced to some extent in Spain and Portugal. In fact the very best corks, as f. i: champagne corks, are entirely cut by hand. It is said that owing to their unevenness, i. e., on account of not being exactly round, they make much better stoppers.

Sorting of the Corkwood.—The first step is the sorting of the corkwood, for although every bale is stamped A, B, C, D, etc., according to its quality, it is again assorted. It must be remembered that the thickness of the bark determines the maximum diameter, not the length of the cork, as the *cutting* is *done across* and *not with the grain*.

Steaming.—As the corkwood is very dry and brittle after its long journey and storing, it is necessary to soften it so as to make it workable. This is done in large covered vats by means of steam. The steaming process makes the corkwood flexible and also slightly increases its bulk and especially prepares it to undergo the following mechanical operations:

Slicing.—By means of a special machine, a slicer with razor-like circular steel knives making hundreds of revolutions every minute, the softened bark is cut into strips, according to the desired length of the cork. It can then be seen that the thickness of the bark determines the maximum width of the finished cork and that the width of the strips represents the length of the cork.

Punching.—From these slices by means of a blocking or punching machine, the straight or cylindrical corks are cut out. This is quite a dangerous operation and many a workman, who has to guide the strips to be punched, has lost one of his fingers.

Straight Corks.—These processes, as we have seen, produce the straight corks.

Tapered Corks.—The corks used in pharmacy are the tapered kind. These are

manufactured from the "straight" variety by passing them through a machine which by means of a very sharp circular knife "tapers" the corks.

Polishing.—In order to produce a very smooth cork, they are polished by rapidly rotating emery wheels.

Bleaching and Washing.—To clean the corks which of course have become soiled through these mechanical operations and in order to give them the white appearance instead of the reddish color of the natural corkwood, they are bleached and washed. This is done in very large vats, the first bath containing a weak solution of chlorinated lime, the second one of oxalic acid. The corks are then rinsed in hot water and dried by whirling in large revolving cylinders of galvanized wire netting. This quick drying is a necessity as in slow drying the corks might develop a mould.

Grading and Assorting.—The last and perhaps most important step is the grading and assorting of the corks. This is done by girls, who in time become expert in this work, which they perform with such rapidity as to assort 20,000 corks during one day's labor.

Storing.—The proper storing of corks is of great importance. They should be kept not too dry nor too damp, as in the former case they become brittle and in the latter they get mouldy. In my own experience I have found the best way to keep the stock in the cellar but not directly on the cellar floor. For the corks in the store I keep a moistened piece of blotting paper in each compartment. This will supply the necessary moisture and saves me a good deal of annoyance by "breaking off" when putting corks into bottles.

Packing.—As is well known to every pharmacist, the corks are packed in five-gross bags. The slow counting has been replaced by the quicker weighing, the weight of each five gross of the different lengths and grades being known to the manufacturer.

Scale of Diameter of Corks.—There is no special rule as to the length of the corks which are usually graded as short, regular, long and extra long. But there is a standard for the diameter of corks, the U. S. Standard. The corks are measured at the upper or larger end and a cork with a diameter of 1 inch is called No. 10. The difference in each size is $1/16$ of an inch. No. 9 measures $15/16$ inch diameter, No. 8 measures $14/16 = \frac{7}{8}$, etc.

Fancy Corks.—There are corks which are branded on the side or have initials or monogram on top. Some are made with a polished wooden top, others with aluminum top. There are also corks covered with a rubber covering in place of the more expensive rubber stoppers. Corks having a camel's hair brush inserted, as for corn cure, might also be enumerated in this category.

Other Corks.—Besides the tapered prescription corks used by pharmacists, there are a great many other varieties, f. i., the straight corks from the finest quality champagne corks down to the common soda water cork; flat corks for wide mouth bottles or jars, the so-called specie cork; shell corks with a perforated center, generally used with a sprinkler top; disks—these are very largely used as a lining for metal bottle caps. The cork is sliced or split by very sharp circular saws and from these flat pieces about $1/9$ inch thick, the disks are stamped out.

Paraffined Corks are prepared by rotating the dry corks in large hot drums with just sufficient melted paraffin to be absorbed. Through the rotating these corks are polished at the same time. Paraffined corks could with advantage be used much more than they are at present; they are especially useful for acid and also alkaline liquids. It may perhaps be not generally known that the reason the corks of some of the proprietary preparations as milk of magnesia or milk of bismuth are not attacked is because they are paraffined. I have some corks here which have been in contact with magma magnesiæ for over one year.

The discoloration of ordinary cork as well as the discoloration of the milk of magnesia can easily be explained, as the suberin in the cork is saponified by alkalies.

Other Articles from Cork.—Among the numerous other articles manufactured from cork, life preservers are perhaps the most important. According to the U. S. regulations they must not weigh over seven pounds.

Other articles are ring buoys, mooring and anchoring buoys, yacht fenders, seine corks for fishing nets, insoles and soles for shoes, floats for plasterers, wheels for polishing glass, balls to be used at seashore, artificial limbs and a great many smaller articles as bobbers for fishing lines, handles for fishing rods, bicycles and pyrographic instruments, tips for penholders, strips for eye glasses, etc., etc.

Use of Waste.—The waste in a cork factory is tremendous, amounting to about 60 per cent. All of this waste is saved even the dust at the various machines which by powerful air suction is carried away by pipes. The waste is ground or powdered and utilized to manufacture linoleum, together with linseed oil, floor tiling, cork cardboard, etc.

Together with melted pitch it is pressed into insulating cork, which is a non-conductor of heat and a non-absorbent of moisture. Thus far I have been unable to learn if ground cork is also used in the manufacture of breakfast food. I should, however, not be surprised to see it advertised for this purpose, f. i.

“Suberite gives an appetite,” or,
“Corkite breakfast food is a corker.”

Artificial Cork.—In going over the available literature on cork I also came across a patent for the manufacture of artificial cork from ground cork, glue, sodium carbonate and calcium chloride. How successful this combination works I am unable to state, but hardly think it can replace the natural corkwood.

Importation and Duty.—The importation of cork into the United States amounts to over five million dollars annually. There is no duty on the cork wood, but 30 per cent. ad valorem for manufactured material. The duty on cork stoppers up to three-fourths inch in diameter is 25 cents per pound and above that 15 cents per pound.

Inventions by Pharmacists.—I might also mention that the cork borer which has largely succeeded the rat tail file was invented by the German pharmacist Carl Friedrich Mohr (1806-1879), the father of volumetric analysis, who also originated the graduated burette and the pinch cock which bear his name. In 1860 the cork machine was first recommended by a German pharmacist in the Pharmaceutische Centralhalle. The pharmacist, C. L. Lochman, took out a United States

patent on August 27, 1867, on the well-known rotary cork press, which is used today.

Literature.—Among the literature which I have consulted I beg to point out the following:

Flückiger: *Pharmakognosie des Pflanzenreiches.*

Hager: *Pharmazeutische Praxis.*

Beckmann: *Geschichte der Entdeckungen und Erfindungen.*

Schelenz: *Geschichte der Pharmazie.*

Tschirch: *Handbuch der Pharmakognosie.*

Rousset: *Culture, Exploitation et Management du chêne-liège en France et en Algérie.*

As stated at the beginning of my paper, the literature on this subject in English is very scant indeed, especially in books which are available to the pharmacist. For this reason I trust that my somewhat lengthy treatise will give the pharmaceutical profession some idea as to the history, origin, cultivation and manufacture of cork.

BROOKLYN, NEW YORK, March 11, 1912.

ON BEING GOOD WITHOUT DOING GOOD.

"I do not know any occupation that is worth so little while to grown-up people as simply being good without doing some good. Of course, there are some people that are perfectly satisfied with the appearance of things. There are men that don't need any money and don't want it, and just get the community to believe they have it. So we find them in every community straining every effort and living as we call it beyond their means and keeping up appearances, trying to make themselves believe that they have what they know they have not. Why I know among my own friends—none of them are here, but there are some few in the community, who are riding in limousine cars that cannot afford the price of a wheelbarrow and all because gasoline to some nostrils smells like a bank account.

"I know a woman who goes home in a taxi and then borrows a quarter to start the gas meter. There are those, of course, that want the real coin and they strive to get it at any cost, and as Donald G. Mitchell says, they economize by denying themselves what they want while young, that they may have that that they don't want when they are old."—*Charles F. Moore*, Editor of "Paper."

BORROWING AND CREDIT.

"Credit is like some people you and I know; it is always hanging around where it is not wanted and it is never on hand when you want it. The man who is penniless and hungry has trouble to negotiate a loan sufficient to buy a sandwich. But if perchance he becomes possessor of a vast estate tomorrow, then every idle dollar in the community is thrust upon him to use on his own terms and return it when he gets ready. I know what I am talking about, because I have had occasion to investigate this subject."—*Charles F. Moore*, Editor of "Paper."