PREPARATION OF TURTLE OIL CREAMS

The following formulas were tried:

Formula A	
Turtle oil	50
Almond oil	27
Lanolin	15
Beeswax	8

Formula B	
Turtle oil	30
Almond oil	46
Lanolin	16
Beeswax	8

Both formulas gave creams which were pale yellow and soft, the odor of lanolin being well marked in both, notwithstanding the previous addition of perfume oil.

To prepare a cream with better consistency than that of the formulas previously prepared, the following was devised:

Turtle oil	15 Gm.
Almond oil	20 Gm.
Lanolin	8 Gm.
Beeswax	10 Gm.
Borax	0.02 Gm.
Distilled water	10 cc.

The cream obtained had, besides a better consistency, a creamy opaque appearance, although the odor of lanolin still persisted. It had a paler color.

The following formula was also tried:

Turtle oil	8 Gm.
Beeswax	20 Gm.
Paraffin wax	15 Gm.
Mineral oil	80 Gm.
Borax	2 Gm.
Distilled water	50 Gm.
Perfume oil	1.5 Gm.

The cream thus prepared had a consistency suitable for the Philippine climate. It is creamy, opaque and white.

A study of the compiled data on turtle oils especially with reference to the data given by Brown (1) shows that Philippine turtle oil compares favorably with the turtle oils obtained in other countries.

SUMMARY

A liquid fatty oil was obtained from a Philippine turtle. Its physical and chemical properties were studied. Its behavior under some color tests, under the antimony trichloride test for vitamin A and under the McCollum and Prebluda test for vitamin B_1 was observed. The results of the analysis show that the oil examined compared favorably with turtle oils obtained in other countries. Using some of the formulas given in the literature on turtle oil, creams were prepared from the Philippine sample.

REFERENCE

(1) Brown, F. W., *Drug and Cosmetic Ind.*, 32 (1933), 211.

Studies on Viburnum

IX. The Pharmacognosy and Pharmacology of Viburnum Alnifolium*

By Heber W. Youngken† and James C. Munch‡

During the summer of 1939, while engaged in field work in the southern United States, the senior author ascertained that large amounts of the bark of the Hobble-bush, *Viburnum alnifolium* Marsh., were being collected in the southern Blue Ridge district and marketed as "Southern Cramp Bark" and as "Cramp Bark." Later, it was ascertained that this practice has been going on for some time, the bark being admixed occasionally by collectors with bark offered to dealers as Black Haw Tree Bark and frequently substituted for genuine Cramp Bark or Viburnum Opulus, N. F. Since certain pieces of these barks bear a striking superficial resemblance one to the other, it is not strange that this substitute has eluded identity.

The chief purposes of this investigation were to study the physical characteristics, histology and pharmacology of the stem bark of *Viburnum alnifolium* and to develop means of distinguishing it from genuine Cramp Bark.

EXPERIMENTAL

Materials and Methods.—The materials used in the pharmacognostical portion of this investigation consisted of representative parts of plants of *Viburnum alnifolium* gathered on Mt. Mitchell, N. C., and in Aroostook Co., Maine, and of representative parts of plants of *Viburnum opulus* var. *americanum* gathered in the Arnold Arboretum, Jamaica Plain, Mass., and in Aroostook Co. and Orono, Maine, by the senior author, several samples of bark labeled

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"Cramp Bark" but which, upon comparison with authentic material proved to be *Viburnum alnifolium* stem bark, and authentic commercial Cramp Bark collected near Falmouth and Farwell, Michigan.

The shrubs were studied in the field and representative portions of them, such as leaf and flowering or fruiting branches and segments of stems of different levels from tip to base, removed and partly pressed and mounted on herbarium sheets and partly preserved in alcohol for future laboratory study.

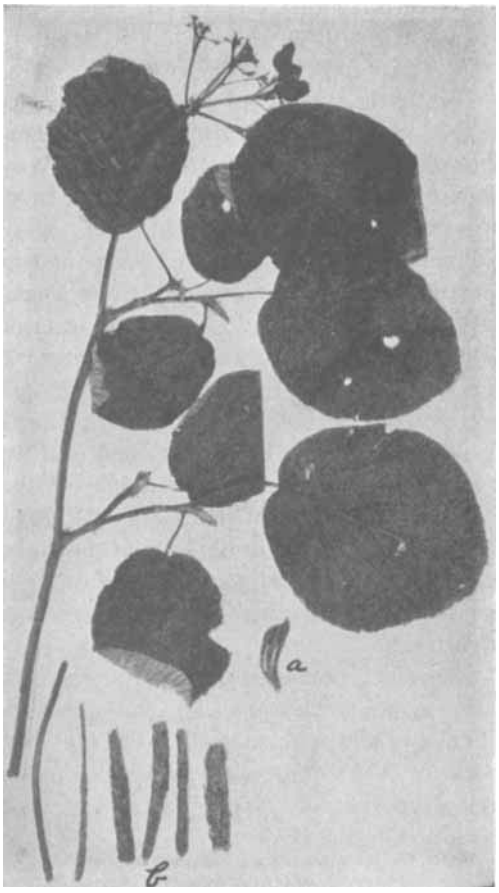

Fig. 1.—*Viburnum alnifolium.* Leaf and Fruiting Branch Showing Winter Buds. Separated Winter Buds (*a*), and Bark of Stem (*b*).

Authentic bark was also collected in the field from both of these species, partly preserved in 95% alcohol and partly dried. All specimens were labeled at the spot of collection.

The physical characteristics of the stem barks together with their histology were studied in the laboratory. Transverse, radial-longitudinal and tangential-longitudinal sections were cut from stem barks removed at different levels from twigs to bases of stems. Some of these were mounted in water, chloral hydrate solution, phloroglucin-HCl, cyanin solution and ferric chloride test solution while others were stained with safranin and fast green, dehydrated, cleared and mounted permanently in Canada balsam, preparatory to microscopical examination.

The powdered bark material discussed in this paper was ground from bark collected from nature by one of us (H. W. Y.).

Several pounds of botanically authenticated *Viburnum alnifolium* stem bark were forwarded to Dr. J. C. Munch to be used in his pharmacological studies.

Description of Viburnum Alnifolium.—*Viburnum alnifolium* Marsh., is a beautiful shrub with glossy, purple to purplish brown twigs, large, orbicular to broadly ovate, dark green leaves with short acuminate summits, cordate or sub-cordate bases and irregularly serrulate to denticulate margins. They take on a deep claret to reddish purple color in autumn. It bears compound cymes of large, white, neutral, marginal flowers and smaller, greenish, central, fertile flowers. The flowers appear in May and June and are succeeded by ellipsoidal, to broadly ellipsoidal drupes about 8 mm. in length which are at first coral-red, later becoming purple-black. The winter buds, some of which we have found in the marketed drug, are large, tomentose and cinnamon-brown. They are devoid of scales and their hairs are stellate in character. The leaves exhibit pinnate-reticulate venation and are densely pubescent beneath, especially on the veins.

Distribution.—*Viburnum alnifolium*, also known as Hobble-bush, American Wayfaring-tree, Witch Hobble and Moosewood, is distributed widely in moist woodlands from New Brunswick and Maine westward to the interior of Ontario and Michigan and southward into the mountains of Virginia, North Carolina, Tennessee and Kentucky. In the northern states it often occurs in the same general regions where *Viburnum opulus* var. *americanum* abounds.

Now, *Viburnum opulus* var. *americanum* (Mill.) Ait., the Cranberry-tree or High Bush Cranberry, which yields the genuine Cramp Bark is distinctly a northern shrub and does not occur in the wild state below the Mason and Dixon line. In Gray's "Manual of Botany" its distribution is given as along streams and in woods from Newfoundland and eastern Quebec to British Columbia south to New Jersey, Pennsylvania, Michigan, Wisconsin and N. E. Iowa (1). It occurs in LaGrange Co., Indiana, and is very abundant in Maine and in certain sections of Michigan.

Physical Characteristics of Stem Bark.—The bark on the young twigs of *Viburnum alnifolium* is externally purplish to purplish brown, smooth and polished with scattered circular to oval, raised lenticels and less than 0.5 mm. in thickness when dried. The fracture of its outer and middle bark is short, that of the inner bark, short-fibrous, the fractured surface showing projections of fibers in the inner bark and this region frequently separating

in the process of breaking and exposing the greenish middle bark. The inner surface of this young twig bark is pale brown and longitudinally striate on pieces of entire bark, but many pieces of commercial young bark are devoid of inner bark and so exhibit the green color of the middle bark.

The dried bark from older portions of the stem varies on its outer surface from purplish brown, through dark brown to blackish brown. Some pieces show grayish foliaceous lichens, some light brown lenticels, while others exhibit irregular longitudinal fissures, cracks and ridges. As this bark becomes older, the cork becomes cracked in irregular longitudinal fashion and through these cracks the greenish to light-colored subjacent tissue is to be noted. It also becomes scaly, the scales representing dead cork tissue in the process of exfoliation.

The fracture of the older bark is short in the outer bark zone and fibrous in the inner bark. The cork is readily detachable in areas on some of the pieces, while other pieces exhibit partly detached outer, middle and inner zones of bark. The inner surface of older pieces of bark varies from pinkish brown to pale brown and is finely longitudinally striate to nearly smooth; that of many pieces of commercial bark exhibited a whitish, adherent wood.

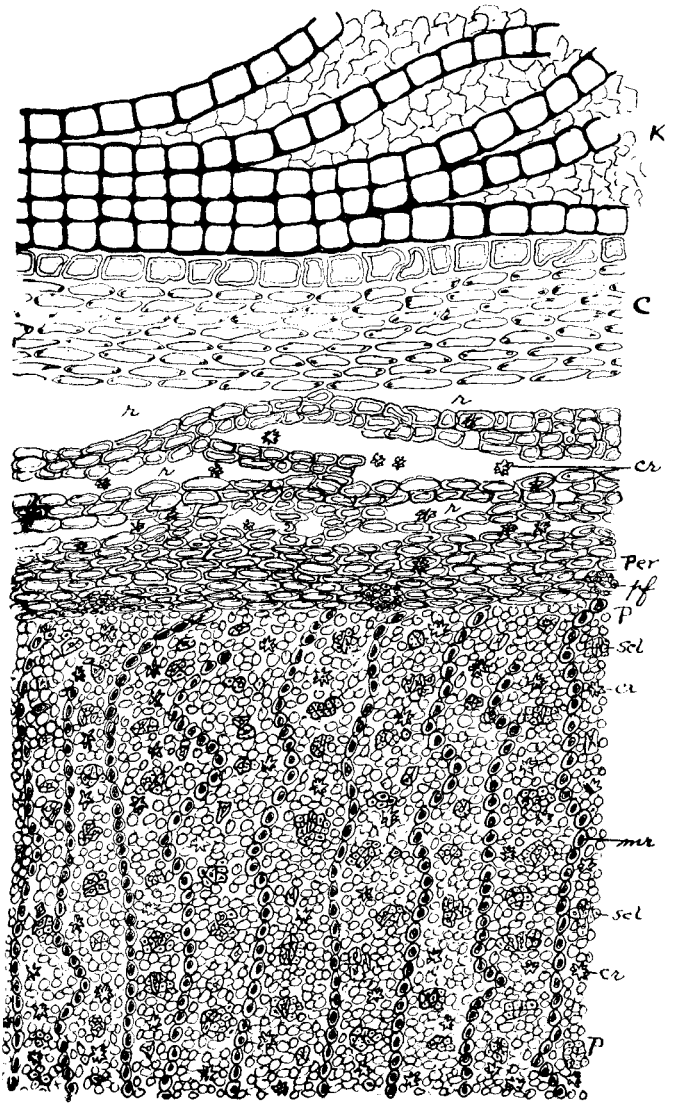

Fig. 2.—Transverse Section of Portion of Older Stem Bark of *Viburnum alnifolium*, × 85.

K, cork, consisting of thin- and thick-walled cork cells which alternate in places; *C*, cortex; *r*, rifts; *cr*, rosette aggregates of calcium oxalate; *Per*, pericycle; *pf*, pericyclic fibers; *P*, phloem; *scl*, bast fibers; *mr*, medullary ray.

Admixed with the average samples of commercial bark examined were twigs of purple to purplish brown color which possessed a large, white pith and also occasional naked winter buds. The latter were up to 2.3 cm. long, cinnamon-brown to purplish brown in color and covered with a rufous tomentum.

Toward the base of older stems of this shrub the outer bark is grayish black scaly, with the cork separated by short fissures into numerous small, polygonal plates.

The odor of the bark is slight when dry but characteristically valeric acid-like when the bark is boiled with water or triturated with phosphoric acid. The taste is bitter and somewhat astringent.

Histology of the Stem Bark.—Sections cut at different levels in succession, commencing with the young twig bark and descending toward the base of the stem presented the following microscopic structure:

No. 1.—Transverse section 0.75 mm. in radial diameter. (First-year growth.) This section showed an epidermis of somewhat rectangular-shaped cells in the process of disintegration, 5 or 6 layers of tangentially elongated, wavy cork cells, beneath which were noted interrupted areas of loose, open tissue representing young cork and phellogen in the process of cork formation. These cells were large and more or less radially elongated, the young cork cells with thin, colorless walls. Between these areas the cells appeared meristematic. There followed a relatively broad zone of cortex whose outer region consisted of from 10 to 12 layers of tangentially elongated, porous parenchyma tissue, some of the cells of which contained starch, others rosette aggregates of calcium oxalate. The inner zone of cortex of a nearly equal magnitude was composed of larger-celled parenchyma with similar contents. Rifts occurred in both zones. Beneath the cortex a narrow zone of pericycle was noted consisting of starch- and crystal-bearing parenchyma through which coursed numerous pericyclic fibers forming an interrupted arc. These were arranged in small groups of 2 to 9 fibers and as occasional isolated fibers. In transverse view they were mostly elliptical in outline, with walls averagely considerably thicker than lumen. Most of them possessed non-lignified walls, a few showing a beginning of lignification. Beneath this region occurred a phloem, up to 171μ in radial diameter traversed by nearly straight medullary rays of 1 to 2 cells in width.

Each phloem strand was composed of phloem parenchyma, sieve tubes and companion cells.

No. 2.—Transverse section 0.95 mm. in radial diameter. This section showed fully developed lenticels. The epidermis was adherent in shreds. The cork consisted of several layers of tangentially elongated cork cells of wavy contour and brown walls which were suberized. Beneath this was a phellogen which had cut off on its outer face a zone of large, clear, thin-walled, young cork cells which in some places was but one cell in breadth, in others, especially in the region of lenticels, 3 or 4 layers broad. On the inner face of the thin-walled cork

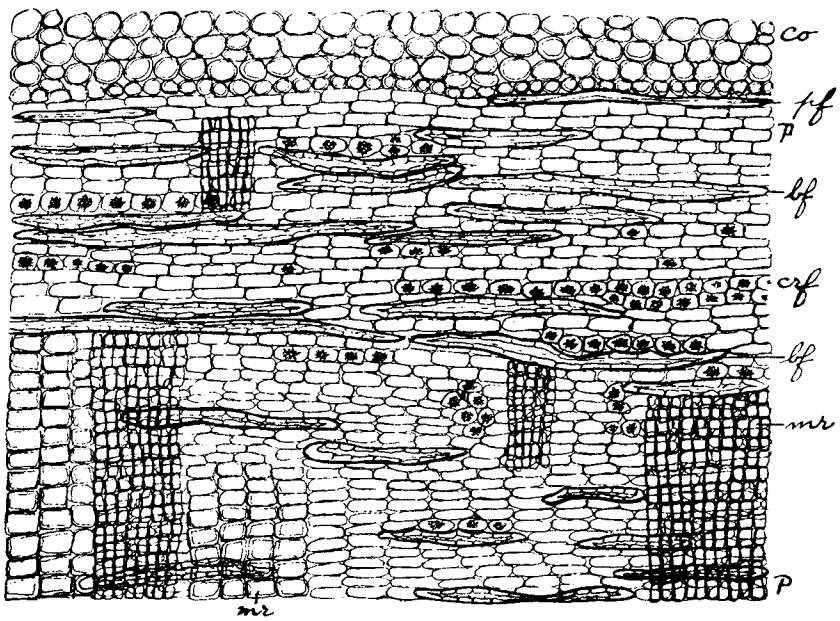

Fig. 3.—Longitudinal-Radial Section of Inner Cortex, Pericycle and Phloem, Old Stem Bark of *Viburnum alnifolium*, × 85.

co, cortex, *pf*, pericyclic fibers in pericycle; *P*, phloem; *bf*, bast fibers; *crf*, crystal fibers containing rosette aggregates of calcium oxalate; *mr*, medullary rays.

zone there occurred 1 to 2 layers of tangentially elongated, brown cork cells with suberized walls. The cortex and pericycle were similar to section 1 in aspect, excepting that here and there a pericyclic fiber showed a beginning of lignification as evidenced by the pink color imparted to the peripheral portion of its wall. The phloem region resembled No. 1 excepting for the appearance of a few phloem fibers in its outer region. These were non-lignified.

Nos. 3 and 4.—Transverse sections 0.63 mm. to 1 mm. in radial diameter. These were similar to the last but with more epidermis exfoliated. No. 4 showed a slightly broader phloem.

No. 5.—Transverse section 1.12 mm. in radial diameter. Exfoliation of outer cork layers had begun. More rifts were evident in the cortex and pericycle. The phellogen had laid down in places a second zone of open, thin-walled and radially elongated cells beneath the second zone of thick-walled, brown cork cells. Lignification had progressed in the bast fibers.

No. 6.—Transverse section 1.135 mm. in diameter. The periderm showed alternating zones of thick-walled, brown and thin-walled, larger and open-looking cork cells. The cortex showed an increased number of rifts. The phloem was slightly broader with an increased number of bast fibers the latter showing increased lignification. The medullary rays occurred in convergent groups. The outer cork layers were partly exfoliated.

No. 7.—Transverse section 1.520 mm. in radial diameter. The periderm showed considerably more loose, thin-walled, suberous tissue. It contained several alternating zones of brown and colorless cork cells, the colorless zones being mostly broader than in the preceding sections. The cortex was broader owing to the phellogen having cut off secondary cortex. The radial diameter of the phloem was 320μ. The phloem showed an increased number of bast fibers, some of these being in large, irregular, tangentially arranged groups. Some of the phloem rays were wavy in character. Rifts were numerous. Druses appeared more numerous than in the previous sections.

No. 8.—Similar to No. 7 but showing more exfoliation of periderm. This section was 1.55 mm. in radial diameter.

No. 9.—Transverse section 1.2 mm. in radial diameter. This section was cut through a lower level of the bark than the preceding, its smaller diameter being accounted for by the loss of considerable of its cork through exfoliation. Passing from outer to inner margin of section, the following was observed: An outer zone of collapsed, thin-walled cork cells, a broad zone of several layers of thick-walled cork cells of dark brown aspect, interrupted zones of thin-walled, somewhat radially elongated cork cells, a phellogen, a broad cortex, showing many rifts, a narrow pericycle with an increased number of fibers arranged in interrupted groups, a few isolated, a broader phloem with convergent groups of medullary rays, some of the rays being straight, others curved in their course. The phloem patches contained scattered groups of bast fibers most of which possessed thick non-lignified walls, a scattered few showed lignification. A number of phloem patches contained secondary phloem rays. Rosette aggregate crystals of calcium oxalate were abundant in the parenchyma of the section.

No. 10.—Transverse section of Old Stem Bark, 2.88 mm. to 3 mm. in radial diameter.

1. Periderm of many alternating layers of thin-walled and thick-walled cork tissue and a phellogen. The thick-walled cork cells were orange to brown in color and more or less collapsed.

2. Secondary cortex of up to 10 layers of collenchyma, the cells containing either starch grains, druses or resinous substance. The druses were up to 40μ in diameter.

3. Primary cortex of several layers of starch- and crystal-containing parenchyma, the cells tangentially elongated. Several rifts occurred in the cortical zones.

4. A pericycle consisting of a narrow zone of starch- and crystal-bearing parenchyma in which occurred numerous groups of pericyclic fibers with lignified walls.

5. Phloem, consisting of a very broad zone (1440μ in radial diameter) separated into many oblong phloem patched by phloem rays, the latter 1 to 2 cells in width. A large number of bast fibers with lignified walls and occurring either isolated or in groups of from 2 to 12 were to be found in every phloem patch.

Sections mounted in ferric chloride solution showed abundant tannin.

Radial-longitudinal section of Old Stem Bark. In this section the collenchyma cells appeared rounded to only slightly elongated and showed irregular lumina and walls of irregular thickness. Some of the pericyclic fibers were slightly lignified but others non-lignified. They possessed very thick walls, narrow lumina and attenuated, often obtuse ends and were up to 22.8μ in width. Some of them were wavy walled. The walls of these fibers were up to 11μ in thickness. Numerous rosette crystals of calcium oxalate and crystal fibers containing rosette crystals were found in the parenchyma of the cortex and phloem.

The medullary rays, crossing areas of the phloem, possessed cells with beaded, porous walls, some of the walls being lignified. The bast fibers were numerous in the phloem. Those measured were up to 38μ in breadth. They showed great irregularity in respect to their walls and lumina. The walls varied considerably in thickness, degree of lignification and in contour. Some were wavy and tuberculate, others lobed. Their ends varied, some being curved or hooked, others acute, rounded or lobed. Occasional stone cells were met with in some of the sections. These usually occurred in smaller groups than in *Viburnum opulus* or as isolated elements.

Tangential-longitudinal section of Old Bark. In this section the medullary rays were 1 to 2 cells in width. The great irregularity in contour and thickness of the walls and lumina of the fibers appeared most striking and diagnostic. Some of them were wavy toothed or wavy, and their ends varied from acute, obtuse, truncate to lobed.

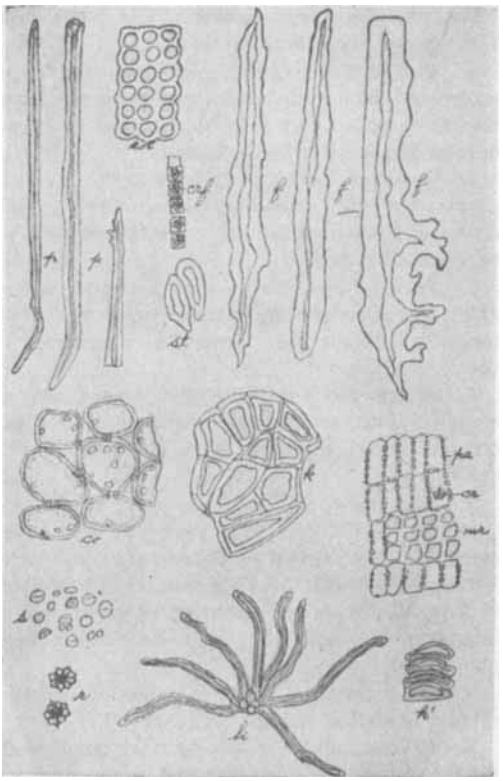

Fig. 4.—Powdered *Viburnum alnifolium* Stem Bark. *p*, pericyclic fibers; collenchyma from cortex; *crf*, crystal fiber; *st*, stone cells; *f*, phloem fibers; *co*, cortical parenchyma; *pa*, phloem parenchyma; *cr*, rosette aggregate crystal of calcium oxalate; *mr*, portion of phloem medullary ray in longitudinal radial view; *k*, cork in surface view; *k'*, cork in traverse view; *s*, starch grains; *h*, aggregate hair from epidermis of bud of *V. alnifolium* which is frequently found in the powdered stem bark.

Powdered Viburnum Alnifolium Stem Bark.—Light brown. Starch grains mostly simple, a few from 2- to 3-compound, the individual grains mostly under 8μ in diameter and of spheroidal, oval or plano-convex shape with central cleft hilum; numerous fragments of starch- and crystal-bearing parenchyma and collenchyma, an occasional starch grain up to 15μ; with slightly excentric, cleft hilum; numerous rosette aggregates of calcium oxalate up to 40μ in diameter; fragments of cork tissue of brown or orange color and of irregularly polygonal or rectangular cells with brown, amorphous contents, the cork often adherent to subjacent collenchyma; numerous fragments containing sclerenchyma fibers having narrow, irregular lumina and with thick, non-lignified to lignified, frequently irregular, wavy walls, the latter from about 4 to 12μ in thickness; an occasional stone cell or group of stone cells, the latter with broad lumina.

Distinctions between Viburnum Opulus and Viburnum Alnifolium Stem Barks.—In a paper by one of us (2) published in THIS JOURNAL in 1932, the physical characteristics and histology of the stem bark and root bark of *Viburnum opulus* var. *americanum* was discussed at some length.

Since that time, considerable additional material has been examined representing stages in the development of these barks not previously studied. The results of these additional studies in so far as they apply to the practical methods of distinguishing the two stem barks here discussed will be incorporated with the relevant portion of the earlier paper in distinguishing between Viburnum Opulus, N. F. and Hobble-bush stem bark. The chief differences follow.

The outer surface of dried young twig bark of *Viburnum opulus* var. *americanum* is purplish to purplish brown with a finely fibrous fracture and its surface is polished, but the average commercial sample of young bark is collected back of the first or second node of the stem and this varies from gray to grayish brown to greenish yellow or greenish brown and is irregularly longitudinally wrinkled, often showing a few slightly raised lenticels. Such bark occurs in thin pieces.

The outer surface of the stem bark of the Hobble-bush or *Viburnum alnifolium* as found on young twigs and on most of the thinner pieces of this commercial bark is purple to purplish brown and glossy and tends to possess more lenticels. Both barks show a greenish phelloderm, where abraded.

The fracture of most thin pieces of commercial authentic *Viburnum opulus* is short and weak, exhibiting few or no projecting fibers, whereas that of *Viburnum alnifolium* is short in the outer bark and fibrous in the inner bark, and it frequently separates into layers on breaking.

Dried older stem bark of *Viburnum opulus*, as represented by thicker pieces shows an outer surface which varies from gray through grayish brown or grayish black to black (when abraded, greenish to brown) and is longitudinally wrinkled, finely fissured or scaly, whereas dried older stem bark of *Viburnum alnifolium*, represented by the thicker pieces of this bark, has an outer surface which varies from purplish brown, dark brown to blackish brown (when abraded, greenish to reddish brown or cinnamon-brown) and either shows numerous, irregular, longitudinal cracks through which light-colored subjacent tissue is evident or, on very old bark, shows numerous, small, irregularly square or rectangular cork plates (scales) separated by narrow fissures.

The fracture of old *Viburnum opulus* is short and brittle, whereas that of old *Viburnum alnifolium* stem bark is short in the outer bark and splintery-fibrous in the inner bark.

Under the microscope thin transverse sections of most pieces of *Viburnum opulus* stem bark may readily be distinguished from similar sections of stem bark of *Viburnum alnifolium* (1) by the former having cork composed of alternating layers of cells of two kinds, *viz.*, a layer of cells whose inner walls are lignified or both outer and inner walls lignified and a layer of cells having non-lignified walls, whereas the latter show zones of brownish, compressed, suberous-walled cells, alternating with thin, colorless-walled layers of cells.

Whereas some sections of thinner pieces of *Viburnum opulus* stem bark show few or no fibers in the pericycle, fibers are numerous in thinner pieces of the stem bark of *Viburnum alnifolium* both in the pericycle and the phloem.

Sections of old bark of the stem of *Viburnum opulus* exhibit groups of stone cells in the phloem

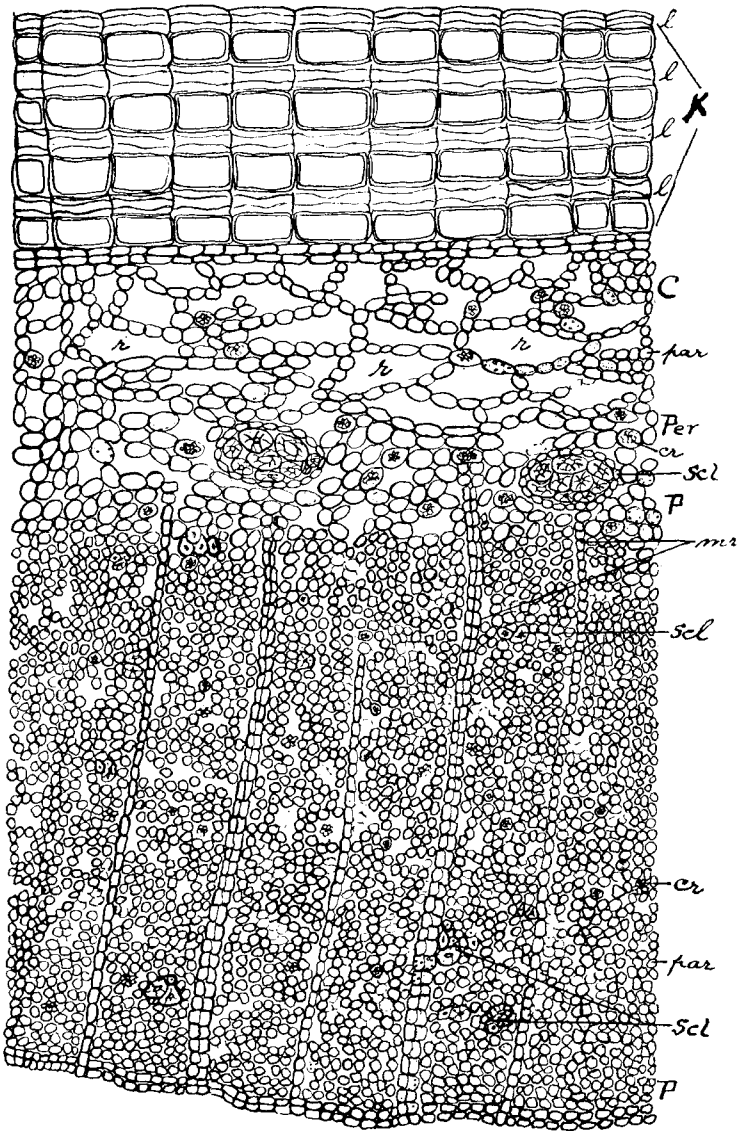

Fig. 5.—*Viburnum Opulus* var. *americanum*. Cross Section of Older Stem Bark, × 75.

K, cork, consisting of layers of cells possessing lignified inner and frequently outer walls alternating with layers with non-lignified walls; *l*-cork cells with lignified outer and inner walls; *C*, cortex; *Per*, pericycle, *P*, phloem; *r*, rifts or spaces surrounded by parenchyma which are abundant in the cortex and pericycle and which also occur in the phloem of this bark; *par*, parenchyma; *Scl*, sclerenchyma; *cr*, druses; *mr*, medullary rays.

which are not infrequently widely scattered, whereas sections of similarly aged bark of the stem of *Viburnum alnifolium* show numerous, closely set groups of bast fibers in the phloem and only an occasional stone cell or small group of stone cells.

Pharmacology.—Several lots of *Viburnum alnifolium* which had been identified by one of us (H. W. Y.) were made into fluidextracts by the N. F. VI method for pharmacological study. To avoid any interfering action by alcohol, these solutions were evaporated over a low heat on an electric hot plate to about $^1/_4$ of their original volume, then restored to the original volume with water immediately before use.

A series of tests on the isolated guinea-pig uterus showed that this dealcoholized solution was a uterine sedative, and physiologically antagonized the oxytoccic action of posterior pituitary extract The stimulant action of pilocarpine was also antagonized. Some evidence of tetany developed after prolonged exposure to strong solutions of *Viburnum alnifolium.*

Figure 6 shows a typical response obtained by the intravenous injection of dealcoholized *Viburnum alnifolium* to a dog anesthetized with morphine and chloretone, and in which the vagus nerves were blocked with atropine. The technique used is essentially that for the assay of epinephrine, outlined in U. S. P. XI, except that curare is not used. The injection of 10 gamma of U. S. P. Standard Epinephrine produced the typical pressor response, the pressure rising from the pre-injection level of 102 mm. to 142 mm., or 40 mm. at 16.22. The

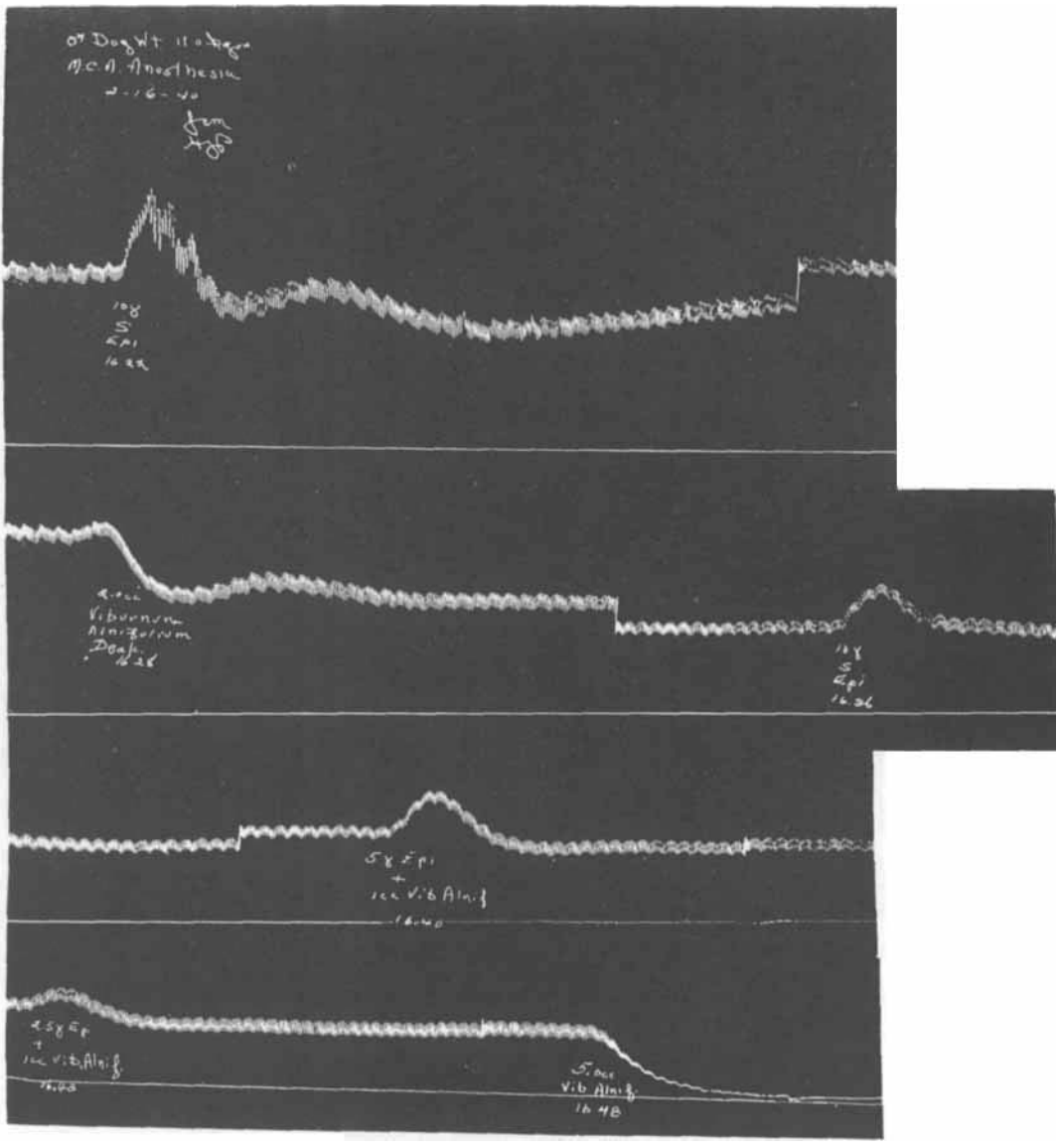

Fig. 6.—Effect of Dealcoholized Fluidextract of Viburnum Alnifolium on the Blood Pressure of an Anesthetized Dog. Note Toxic Effect and Death.

post-injection level of 104 mm. decreased to 70 mm. following the injection of 2 cc. of dealcoholized *Viburnum alnifolium* intravenously at 16.28 and this pressure was maintained. At 16.36 the blood pressure was 50 mm. and the injection of 10 gamma of epinephrine caused a rise to 72 mm., or an increase of 22 mm.

At 16.40 the blood pressure was stabilized at 54 mm.; the injection of a mixture of 5 gamma of epinephrine with 1 cc. of dealcoholized Fluidextract Viburnum Alnifolium caused a rise to 72 mm., or an increase of 18 mm. in pressure. Since this is less than the rise produced by twice the dose of epinephrine alone, but almost reaching the same level (18 mm. *vs.* 22 mm.) it appears that 1 cc. of this sample is equivalent to not more than 5 gamma of epinephrine, physiologically, and probably to less than 5 gamma.

At 16.43 the injection of 1 cc. of Fluidextract Viburnum Alnifolium with 2.5 gamma of epinephrine caused a rise in blood pressure from 46 mm. to 50 mm., or there was practical neutralization of pressor and depressor activity. This would suggest that 1 cc. of the Fluidextract Viburnum Alnifolium was equivalent to 2.5 gamma of epinephrine.

The further injection of 5 cc. of dealcoholized Fluidextract Viburnum Alnifolium led to death in 2 minutes. This represents a total dose of 2 plus 1 plus 1 plus 5, or 9 cc. of Fluidextract Viburnum Alnifolium to a dog weighing 11 Kg., or approximately 0.8 Gm. of *Viburnum alnifolium* bark per Kg. None of the other species of Viburnum studied have proved toxic to dogs when given in doses as large as 10 Gm. per Kg. which suggests that there is a toxic component in *Viburnum alnifolium* bark in addition to the depressor-uterine sedative constituent. Further studies are being conducted in the connection.

SUMMARY AND CONCLUSIONS

1. The stem bark of the Hobble-bush, *Viburnum alnifolium* Marsh., has been frequently substituted for Viburnum Opulus, N. F. and used to adulterate Black Haw Tree Bark.

2. A description is given of the materials used in this investigation and of the methods employed therein.

3. The shrub *Viburnum alnifolium* is described. Its winter buds and segments of its young, purple stems occurred in many samples of the commercial *Viburnum alnifolium* bark which has been marketed by collectors in the southern United States as "Southern Cramp Bark" and as "Cramp Bark."

4. The distribution of *Viburnum alnifolium* is compared with *Viburnum opulus* var. *americanum*. It is shown that *Viburnum opulus* var. *americanum* does not occur in the wild state in the southern United States.

5. The physical characteristics of the young and old stem barks of *Viburnum alnifolium* are described.

6. A description is given of the histology of ten different thicknesses of the stem bark of *Viburnum alnifolium*.

7. The powdered substitute bark is described. Stellate hairs from the naked winter buds of the shrub yielding it occurred in this powder.

8. Macroscopic and microscopic points of difference between the younger and older stem barks of *Viburnum opulus* var. *americanum* and *Viburnum alnifolium* are elucidated.

9. The methods and results of pharmacologic studies on the stem bark of *Viburnum alnifolium* are reported. It is shown that in addition to the typical uterine sedative and depressor action of the previously studied medicinal Viburnum barks, this bark appears to contain an unknown and unsuspected toxic constituent. In the light of present knowledge, it should not be used under the same conditions as other medicinal Viburnums such as *Viburnum prunifolium* and *Viburnum opulus*.

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(1) Gray's "New Manual of Botany," 7th Edition (1908), page 759.

(2) Youngken, H. W., JOUR. A. PH. A., 21 (1932), 444.

Emil Fischer (1852-1919) was the second recipient of the Nobel Prize for Chemistry. He received the prize in 1902 in recognition of the extraordinary merit of his work on the synthesis of the sugars and purine compounds.

"The pleasantest things in the world are pleasant thoughts; and the great art of life is to have as many of them as possible."
—Montaigne