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Ay, thou art welcome, heaven's delicious breath!
When woods begin to wear the crimson leaf,
And suns grow meek, and the meek suns grow brief,
And the year smiles as it draws near its death.
Wind of the sunny south! oh, still delay
In the gay woods and in the golden air,
Like to a good old age released from care,
Journeying, in long serenity, away.
In such a bright, late quiet, would that I
Might wear out life like thee, 'mid bowers and brooks,
And, dearer yet, the sunshine of kind looks,
And music of kind voices ever nigh;
And when my last sand twinkled in the glass,
Pass silently from men, as thou dost pass.

William Cullen Bryant

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ASBESTOS IN MARYLAND

by

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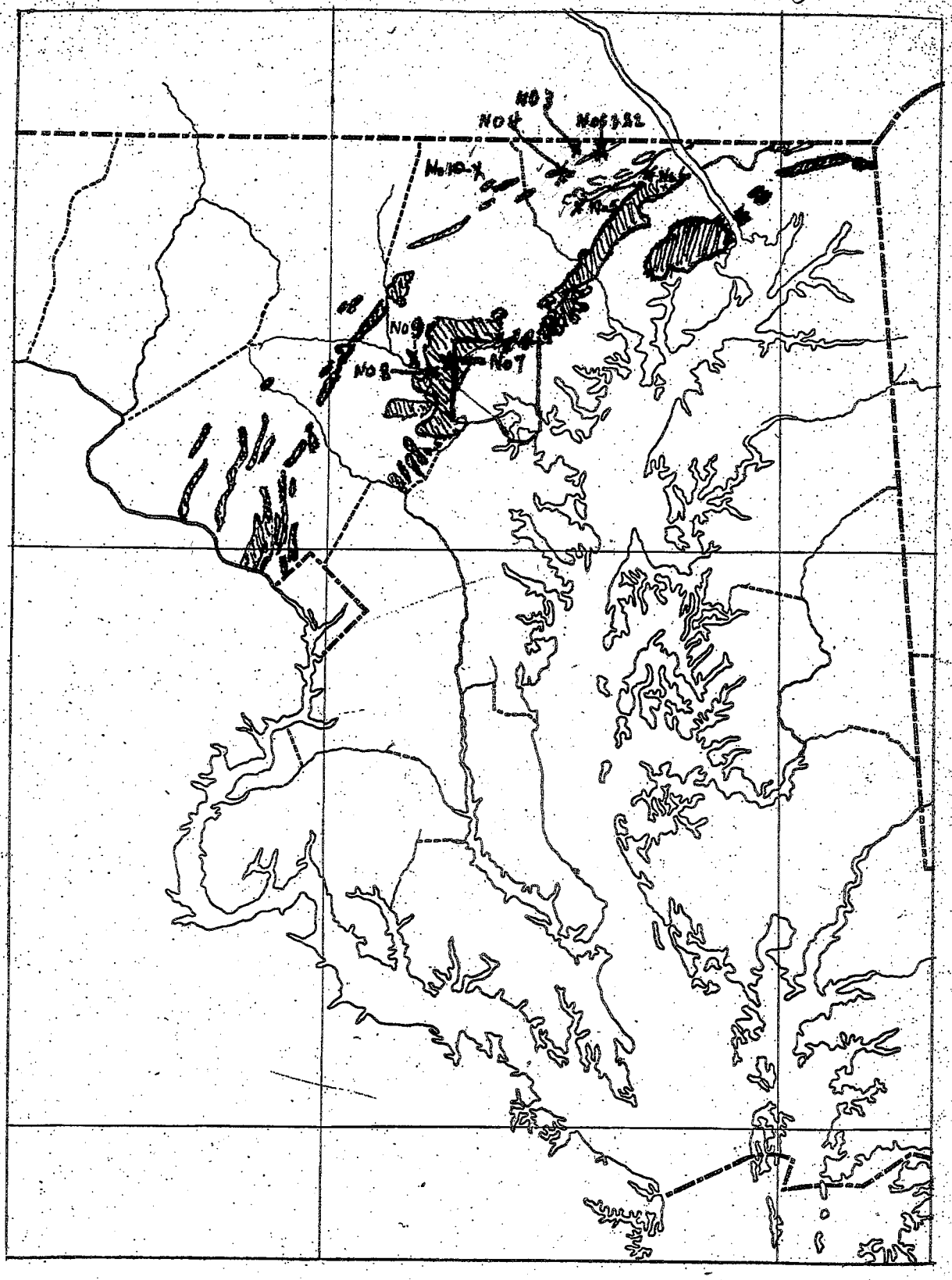
Asbestos did not achieve a prominent position among modern mineral products until the latter part of the 19th century. Within the past 50 years the industry has so expanded that its products are used everywhere and asbestos is practically a household word. Few people realize that Maryland was at one time prominent in the asbestos trade and pioneered certain branches of the industry. Although the deposits of commercial importance are now largely exhausted and there is but a bare possibility that asbestos will ever be worked again in Maryland[1], the deposits themselves and the industry they have fostered are interesting enough to merit a discussion.

A brief summary of some of the most important facts about asbestos may facilitate the discussion of the Maryland deposits. Asbestos is found as cross fiber, slip fiber and mass fiber. Where the individual strands are at right angles to the walls of the vein or seam the asbestos is known as cross fiber. Most commercial deposits are of this type. In slip fiber deposits the individual strands lie nearly parallel to the vein walls. Slip fiber frequently shows evidence of crustal movement (slickensides) because it usually occupies shear or fault zones where the rock has been subjected to movement and pressure. In mass fiber deposits the entire rock is composed of interlocking bundles of fiber without definite orientation.

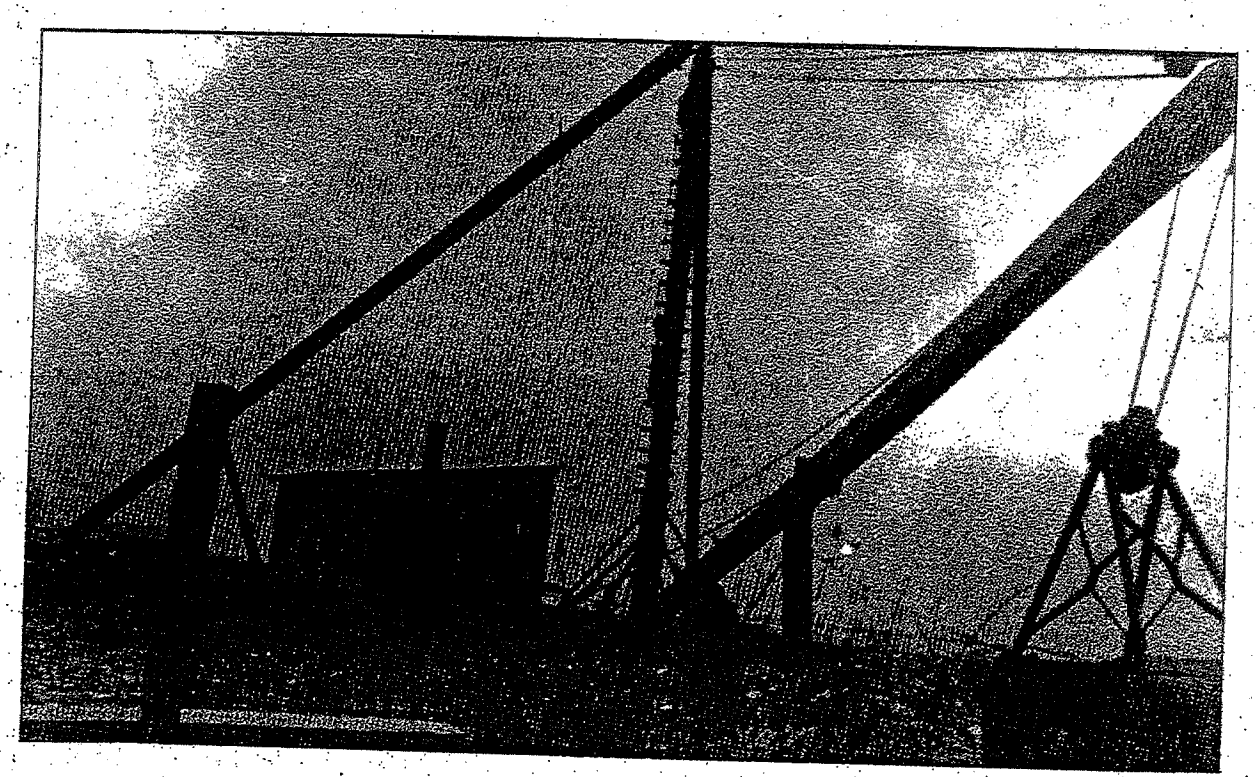
"Asbestos" is not the name of a distinct mineral species but is a commercial term applied to the fibrous varieties of several minerals. The asbestos minerals found in Maryland are chrysotile and members of the amphibole group. Chrysotile is chemically a hydrous magnesium silicate ($H_4 Mg_3 Si_2 O_8$), and is a fibrous, crystalline form of the massive mineral, serpentine, with which it is invariably associated. It has a beautiful, silky luster in various shades of green and greenish yellow and easily fluffs out into a woolly mass. The fibers have remarkable tensile strength and can be spun into strong, lightweight asbestos cloth. Because of its strength, durability and common occurrence in the serpentine, chrysotile is the most important variety of asbestos.

Chrysotile occurs sparingly in the Maryland serpentines. Small seams of silky fiber may be found in the serpentine of Bare Hills[2]. None justifies exploitation. J. T. Ducatel[3] in 1838 mentions asbestos in speaking of the chrome ore associated with serpentine in the vicinity of Coop Town, "Mine Old Field" (probably Mine Fields) and Dublin. He mentions chrome, serpentine, a variety of magnesian minerals and then says, "Associated with these minerals there are varieties of asbestos, that within a few years have come to be extensively used in the manufacture of what are called Stone Paints." The asbestos mentioned by Ducatel might possibly be chrysotile because of the reference to serpentine. If so, this represents the only production of chrysotile in Maryland. The composition of the amphibole group is near that of a metasilicate (R Si Os). It is found in long, white, gray or brown fibers of low tensile strength. Because of its resistance to heat and acids the amphibole group is especially valuable in the manufacture of chemical filters. Amphibole usually occurs as slip fiber in shear zones of such basic rocks as dunite and olivine.



Map showing basic igneous rocks in relationship to asbestos mines

Jenkins Asbestos Mine, Pylesville, Md.



Asbestos Mine of the Powhatan Mining Co.,
Woodlawn, Md.

Slip fiber amphibole has been mined successfully at many points in Maryland in weathered fault zones associated with basic igneous rocks. The weathering and softening of the amphibole determines the depth to which the mineral may be worked. Where the amphibole has not been weathered it is splintery, hard and of little or no value. In most Maryland deposits the soft, fibrous asbestos extends only to a depth of about 25 feet. This factor, combined with the limited extent of the individual fault zones, precludes the use of heavy machinery and extensive operations at any single locality except in a few special cases where the weathering has been more effective at greater depths.[4]

The Maryland asbestos is associated with pyroxene, peridotite or rocks altered from these basic intrusives. Rocks, composed essentially of pyroxene, a dark colored silicate, are known as pyroxenites, while rocks composed of olivene, an iron-magnesium silicate, and pyroxene are known as peridotites. These two rocks are believed to have been formed at the time of the widespread intrusion of gabbro (a dark basic igneous rock) into the piedmont plateau of the Eastern Coast, by differentation of the heavier ferromagnesian constituents out of a gabbroic magma[6,7]. They alter readily to serpentines and talcose rocks and it is possible that the asbestos was formed as an alteration product. Exposures of pyroxenite and peridotite cross Maryland in a northeast to southwest direction, entering the state in Harford and Cecil Counties and passing into Virginia near Great Falls.[8] The distribution of asbestos conforms to this belt of igneous rocks as shown in Figure I. The numbered circles indicate deposits of special interest which will be described.

The Jenkins Asbestos Mine at Pylesville (No.1) was the largest and most important asbestos deposit in Maryland. The formation, according to J. S. Diller,[9] a geologist in the service of the U.S. Geological Survey in 1917, is "a weathered gneissoid schist". Mr. Fred A. Mett, who was responsible for the development of the mine believes that Mr. Diller may be in error and that the country rock is dunite, a rock associated with peridotite but composed almost entirely of olivine. Along fault planes where the movement producing slip fiber tremolite (one of the amphibole group) was more intense and of greater extent, with deeper weathering, suitable fiber extended to a depth of fifty to seventy-five feet. The tremolite was unusually stable and acid resistant and iron free; that from the Jenkins Mine and the nearby Neikirk Mine was believed the best fiber for the manufacture of chemical filters found in the United States. The deposit has unfortunately been exhausted and there is no possibility that asbestos will be worked again at Pylesville.

A small tonnage of high grade fiber was produced at the Neikirk Mine, which adjoined the Jenkins Mine on the west. The deposit was small and weathering shallow, so that operations were short-lived.

Small amounts of asbestos were produced at the Slade Farm (No. 3), the Durham Farm (No. 4), near Coopstown (No. 5), near Dublin (No. 6) and at Powhatan, near Woodlawn (No. 7). This fiber was also produced for use in chemical filters.

At the Bok Asbestos Mine (No. 8) near Hollofield, in Baltimore County, anthophyllite was mined for a short time for the manufacture of asbestos

shingles.[11] The deposit was a typical small, shallow, slip-fiber occurrence. It is doubtful if operations could have been profitable considering the low tensile strength of the amphibole group.

Anthophyllite (another amphibole) was also mined at Alberton (No.9) and an amphibole mineral was mined at Parkton (No.10), but the quality of the deposits was not high enough to meet modern standards and the workings have been abandoned for over fifty years. Asbestos has been found at many other places in the belt shown on the map, but at no point were the indications favorable to further development.[13]

Asbestos mining in Maryland has had a long, interesting history. J. T. Ducatel,[14] in his report of 1837, mentioned the use of asbestos for "stone paints" and as a lining for fire-proof chests. It is probable that this asbestos was anthophyllite. This is the earliest reference to the working of asbestos in Maryland, and many refer to it as one of the first asbestos mining operations in the New World. G. P. Merrill[15] in 1895 described the asbestos from Alberton, Parkton, and Pylesville, gave analyses, and showed the first to be anthophyllite. He mentioned an abandoned shaft and a few shallow prospect holes at Alberton, indicating former operations. The last reference to early asbestos mining in Maryland is in a Maryland Geological Survey publication of 1906.

"In 1880 one mine in Harford County and three in Baltimore County produced a total of forty tons, valued at $1000, but the discovery of extensive deposits in other regions has now stopped any operations for this mineral in Maryland."[16]

After 1880 the history of asbestos mining in Maryland is, with the exception of the relatively unimportant Bok Mine, the history of the Powhatan Mining Corporation. In 1916 the ship shortage of the first World War cut off the supply of chemical filter tremolite from Italy. Mr. Fred A. Mett of Woodlawn attempted to find a use for Maryland tremolite which occurred a short distance from his home at Powhatan (No. 7 on map). With the cooperation of the U.S. Geological Survey and the Bureau of Standards he developed a filter fiber superior to the Italian product.[17]

Mr. Mett worked the deposit at Powhatan for a year, and then abandoned it in favor of the better quality Pylesville deposit. The mine was opened by simple pick and shovel methods. Veins were located, the overburden removed, and the long slip-fiber carefully removed by hand. In 1926 it became necessary to follow the veins to greater depths and a stiff-leg derrick with clam-shell bucket was set up for removing the overburden. In 1928 this arrangement was replaced with a power shovel, which was used continously until the working was finally abandoned in 1940.

Pylesville asbestos supplied the Powhatan Mining Company, the organization formed by Mr. Mett, for a number of years, but the steadily rising demand for the new filter product caused Mr. Mett to prospect extensively through Maryland for other deposits of amphibole. Thousands of holes were drilled with an earth auger in Harford, Baltimore and Howard counties. Wherever indications were favorable test pits were dug and all high grade

asbestos removed. In this manner the mines at the Slade farm, the Neikirk farm, the Durham farm, Coopstown, Rocks and many other lesser points were opened. A power shovel was employed at some of these places but no single locality was nearly as extensive as the deposit at Pylesville. Collectively, however, they yielded a large tonnage of good quality fiber. Mr. Mett estimates that an overburden covering fifteen acres was removed while working these shallow deposits. As the Maryland mines were systematically exhausted Mr. Mett continued this prospecting into other parts of the United States, and when the Jenkins Mine at Pylesville was finally abandoned, all the asbestos used by the corporation was brought in from localities outside Maryland.[18]

The company describes the manner in which they process their material as follows. "At the plant at Woodlawn the asbestos is carefully selected, hand cobbed, washed and concentrated by specially designed machines which remove all gangue (non-fibrous matter) and extraneous impurities. The fibers are dried and digested with pure hydrochloric acid until the iron and other impurities are completely dissolved. By a special filter apparatus and an abundance of wash water all traces of acid are completely eliminated, as well as 'fines' or dust like matter (very minute fibers). This leaves the thoroughly separated asbestos chemically pure and stable. The fibers are dried, graded according to length, and packed for shipment."[19]

The prepared fiber, known under the trade name of "Powmingo" can be ignited in a laboratory Meker burner for fifteen minutes with a loss of only 0.31%. After ignition it is chemically stable and shows no further loss upon continued ignition. This fact, coupled with its extremely low loss after digestion by concentrated acids makes it very valuable for laboratory work, especially where it is necessary to burn off organic matter. The following figures compare losses on ignition and digestion in hot, concentrated HNO_3 between Powmingo and Italian asbestos.[20]

	Powmingo	Italian Asbestos
Loss on 15 minutes ignition in a Meker Burner	0.31%	1.39%
Loss after 5 minutes digestion in hot, concentrated HNO_3	0.01%	0.52%

The Powhatan Company has expanded into other fields of the asbestos industry. Fiber is now used for plastics, fire proofing asphaltic and bituminous composition, heat insulation, composition flooring, furnace linings, fire brick, paints, furnace cement, retort cement, and quite a number of uses that the manufacturers prefer not to mention.[21] Fifty men are employed by the company at the mines and mill and the daily production averages one carload of finished product. Three shifts were operated during the war, but this has now been discontinued. The company appears to possess fine machinery, modern processes and a well established business.[22]

Asbestos will probably never again be mined in Maryland. Mr. Mett thoroughly covered the asbestos production belt in Maryland with drill holes and test pits and it is unlikely that any other commercial deposit will be discovered in the future. Asbestos mining is now only an interesting chapter in the history of our state.[22]

FOOTNOTES

1. Oral communication with Mr. Fred A. Mett, President of the Powhatan Mining Corporation, the organization chiefly responsible for the development of Maryland asbestos.

2. J. T. Ducatel, Ann.Rept. of the Geologist of Md., 1838, p.5

3. Material in this paragraph obtained by oral communication with Mr. Fred A. Mett, President of the Powhatan Mining Company.

4. Differentation in this case means the settling of heavier crystallized matter.

5. A magma is a mass of molten rock.

6. Md. Geological Survey, Baltimore Co., Baltimore 1929, p. 117.,

7. Md. Geological Survey, Geological Map of Md., Baltimore, 1933.

8. J. S. Diller, "Asbestos in 1917," Mineral Resources of the U.S., Washington, 1917, p. 202.

9. Material for the foregoing two paragraphs, with the exception of Mr. Diller's statement, was obtained by oral communication with Mr. Mett.

10. Oral communication with Mr. Bok, owner and operator of the Bok Asbestos Mine.

11. A larger amount of asbestos must be present in an anthophyllite shingle to give strength equal to that of chrystotile.

12. Oral communication with Mr. Fred A. Mett.

13. J. T. Ducatel, Ann. Rept. of the Geologist of Md., Baltimore, 1837, p.15.

14. G. P. Merrill, "Notes on Asbestos and Asbestoform Minerals," Proc. U.S. Nat'l. Museum, Vol. XVIII, Washington, 1895

15. Md. Geological Survey, Rept. on the Physical Features of Md., Baltimore, 1906, p. 208.

16. Material in the foregoing three paragraphs obtained by personal communication with Mr. Mett.

17. Advertising material of the Powhatan Mining Company.

18. Information and data taken from the advertising material of the Powhatan Mining Company.

19. Foregoing material in this paragraph, taken from "The History of the Powhatan Mining Corporation", Asbestos, Sept. 1929, Vol. XI, No. 3, P.22.

20. Foregoing material obtained by oral communication with Mr. Mett.