

a felted mass, the mineral passes under such trivial names as mountain leather, mountain cork, mountain paper, &c. The asbestos formerly used in the arts was generally a fibrous form of some kind of amphibole, like tremolite, or anthophyllite, though occasionally perhaps a pyroxene. In recent years, however, most of the asbestos in the market is a fibrous variety of serpentine, known mineralogically as chrysotile, and probably some of the ancient asbestos was of this character (see AMIANTHUS). Both minerals possess similar properties, so far as resistance to heat is concerned. The amphibole-asbestos, or hornblende-asbestos, is usually white or grey in colour, and may present great length of fibre, some of the Italian asbestos reaching exceptionally a length of 5 or 6 ft., but it is often harsh and brittle. The serpentine-asbestos occurs in narrow veins, yielding fibres of only 2 or 3 in. in length, but of great tensile strength: they are usually of a delicate silky lustre, very flexible and elastic, and of yellowish or greenish colour.

The Canadian asbestos, which of all kinds is at present the most important industrially, occurs in a small belt of serpentine in the province of Quebec, principally near Black Lake and Thetford, where it was first recognized as commercially valuable about 1877. The rock is generally quarried, cobbled by hand, dried if necessary, crushed in rock-breakers, and then passed between rollers; it is reduced to a finer state of division by so-called fiberizers, and graded on a shaking screen, where the loosened fibres are sorted. The process varies in different mills.

In the United States asbestos is worked only to a very limited extent. An amphibole-asbestos is obtained from Sall Mountain, Georgia; and asbestos has also been worked in the serpentine of Vermont. It occurs also in South Carolina, Virginia, Massachusetts, Arizona and elsewhere. Dr G. P. Merrill has shown that some asbestos results from a process of shearing in the rocks.

Formerly asbestos was obtained almost exclusively from Italy and Corsica, and a large quantity is still yielded by Italian workings. This is mostly an amphibole. It is in some cases associated with nodules of green garnet known as "seeds"—*Semenze dell' amianto*. Asbestos is widely distributed, but only in a few localities does it occur in sufficient abundance and purity to be worked commercially; it is found, for example, to a limited extent, at many localities in Tirol, Hungary and Russia; Queensland, New South Wales and New Zealand. In the British Isles it is not unknown, being found among the old rocks of North Wales and in parts of Ireland. Byssolite or asbestoid is a blue or green fibrous amphibole from Dauphiny.

The Asbestos Mountains in Griqualand West, Cape Colony, yield a blue fibrous mineral which is worked under the name of Cape asbestos. This is referable to the variety of amphibole called crocidolite (*q.v.*). It occurs in veins in slaty rocks, associated with jaspers and quartzites rich in magnetite and brown iron-ore. Their geological position is in the Griqua Town series, belonging to what are known in South Africa as the Pre-Cape rocks.

Asbestos was formerly spun and woven into fabrics as a rare curiosity. Charlemagne is said to have possessed a tablecloth of this material, which when soiled was purified by being thrown into the fire. At a meeting of the Royal Society in 1676 a merchant from China exhibited a handkerchief of "salamander's wool," or *linum asbesti*. By the Eskimos of Labrador asbestos has been used as a lamp-wick, and it received a similar application in some of the sacred lamps of antiquity. In recent times asbestos has been applied to a great variety of uses in the industrial arts, and its applications are constantly increasing. Its economic value depends not only on its power of withstanding a high temperature, but also on its low thermal conductivity and its partial resistance to the attack of acids: hence it is used for jacketing boilers and steam-pipes, and as a filtering medium for corrosive liquids. It has also come into use as an electric insulator. It is made into yarn, felt, millboard, &c., and is largely employed as packing for joints, glands and stopcocks in machinery. Fire-proof sheathing and felt are used for flooring and roofing; fire-proof curtains have been made for the stage, and even clothing for firemen. Asbestos enters into the

ASBESTOS, a fibrous mineral from Gr. ἀσβεστος, unquenchable, by transference, incombustible, in allusion to its power of resisting the action of fire. The word was applied by Dioscorides and other Greek authors to quicklime, but Pliny evidently used it in its modern sense. It was occasionally woven by the ancients into handkerchiefs, and, it has been said, into shrouds which were used in cremation to prevent the ashes of the corpse from mingling with the wood-ashes of the pyre.

In different varieties of asbestos the fibres vary greatly in character. When silky and flexible they are sometimes known as mountain flax. The finer kinds are often termed amianthus (*q.v.*). When the fibres are naturally interwoven, so as to form

composition of fire-proof cements, plasters and paints: it is used for packing safes; and is made into balls with fire-clay for gas-stoves. Various preparations of asbestos with other materials pass in trade under such names as uralite, salamandrite, asbestolith, gypsine, &c. "Asbestic" is the name given to a Canadian product formed by crushing the serpentine rock containing thin seams of asbestos, and mixing the result with lime so as to form a plaster.

REFERENCES.—Fritz Cirkei, *Asbestos, its Occurrence, Exploitation and Uses* (Ottawa, 1905); J. H. Pratt and J. S. Diller in Annual Reports on Mineral Resources, U.S. Geol. Survey; G. P. Merrill, *The Non-metallic Minerals* (New York, 1904); R. H. Jones, *Asbestos and Asbestic* (London, 1897).
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