1911 Encyclopædia Britannica, Volume 2 — Asphalt

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ASPHALT, or ASPHALTUM. The solid or semi-solid kinds of bitumen (*q.v.*) were termed ἄσφαλτος by the Greeks; and by some ancient classical writers the name of *pissasphaltum* (πίσσα, pitch) was also sometimes employed. The asphalt of the Dead Sea (known as *Lacus Asphaltites*) received considerable notice from early travellers, and Diodorus the historian states that the inhabitants of the surrounding parts were accustomed to collect it for use in Egypt for embalming. In common with other forms of bitumen, asphalt is very widely distributed geographically and occurs in greater or less quantity in rocks of all ages. There is some divergence in the views expressed as to the precise manner of its production, but it may certainly be said that the principal asphalt deposits are merely the result of the evaporation and oxidation of liquid petroleum which has escaped from outcropping strata. The celebrated Pitch Lake of Trinidad was long regarded as the largest deposit of asphalt in existence, but it is said to be exceeded in area, if not in depth also, by one in Venezuela. The Trinidad “Lake” has an area of 99·3 acres, and is sufficiently firm in places to support a team of horses. The deposit is worked with picks to a depth of a foot or two, and the excavations soon become filled up by the plastic material flowing in from below and hardening. The depth of the deposit is not accurately known. The surface is not level but is composed of irregularly tumescent masses of various sizes, each said to be subject to independent motion, whereby the interior of each rises and flows centrifugally towards the edges. As the

spaces between them are always filled with water, these masses are prevented from coalescing. The softer parts of the lake constantly evolve gas, which is stated to consist largely of carbon dioxide and sulphuretted hydrogen, and the pitch, which is honeycombed with gas-cavities, continues to exhibit this action for some time after its removal from the lake. The working of the deposit is in the hands of the New Trinidad Asphalt Company, who hold the concession up to the year 1930 on payment to the government of a minimum royalty of £10,000 a year. A circular line of tramway, supported on palm-leaves, has been laid on the lake to facilitate the removal of the asphalt. Very large quantities are exported for paving and other purposes, the annual shipments amounting to about 130,000 tons from the lake and about 30,000 tons from other properties. The amount of asphalt in the lake has been estimated at 158,400 tons for each foot of depth, and if the average depth be taken at 20 ft. this would give a total of 3,168,000 tons; but in 1908, though 1,885,600 tons had been removed in the previous thirty-five years, there was but little evidence of reduction in the quantity. The Venezuelan deposit already referred to is in the state of Bermudez, and the area of it is reported to be more than 1000 acres. The asphalt of Cuba is a well-known article of commerce, of which 7252 tons was exported to the United States in 1902. The principal deposits are near the harbour of Cardenas (70 ft. thick), in the Pinar del Rio, near Havana (18 ft. thick), at Canas Tomasita (105 ft. thick); and a specially pure variety near Vuelta.

The comparative composition of Trinidad and Cuba asphalt is given in the following table:—

	Refined Trinidad, Melting point 185° F.	Refined Cuba (soft), Melting point 115° F.	Refined Cuba(hard), Melting point 160° F.
Water	0·17	0·13	0·11
Volatile bitumen	51·81	64·03	8·34
Sulphur	10·00	8·35	8·92
Ash (earthy matter)	28·30	19·51	16·60
Fixed carbon	9·72	7·98	66·03
	100·00	100·00	100·00

The chemical composition of Trinidad asphalt has been given as:—

C.	H.	N.	O.	S.
80·32	6·30	0·50	1·40	11·48

The following is a comparison of Trinidad and Venezuela (Bermudez) asphalt:—

	Refined Trinidad.	Refined Bermudez.
Specific gravity at 60° F.	1·373	1·071
Bitumen soluble in carbon bisulphide	61·507%	92·22 %
Mineral matter (ash)	34·51 %	1·50 %
Non-bituminous organic matter	3·983%	1·28 %
Portion of total bitumen soluble in alcohol	8·24 %	11·66 %
Portion of total bitumen soluble in ether	80·01 %	81·63 %
Loss at 212° F.	0·65 %	1·37 %
Loss at 400° F. in ten hours	7·98 %	17·80 %
Loss at 400° on total bitumen	12·811%	18·308%
Evolution of sulphuretted hydrogen at	410° F.	none at 437° F.
Softening-point	160° F.	none at 113° F.
Flowing-point	192° F.	none at 150° F.

Asphalt in its purest forms is generally black or blackish brown in colour, and is frequently brittle at ordinary temperatures. Apart from its principal use in the manufacture of paving materials, it is largely employed in building as a “damp-course” and as a water-excluding coating for concrete floors, as well as in the manufacture of roofing-felt. It also enters largely into the composition of black varnish. The material chiefly used in the construction of asphalt roadways is an asphaltic or bituminous limestone found in the Val de Travers, canton of Neuchâtel; in the neighbourhood of Seyssel, department of Ain; at Limmer, near the city of Hanover; and elsewhere. The proportion of bitumen present in asphalt rock usually ranges from 7 to 20%, but it is found that rock containing more than 11% cannot be satisfactorily used for street pavements, and it is

accordingly customary to mix the richer and poorer varieties in fine powder in such respective quantities that the proportion of bitumen present is from 9 to 10%. The richer rock is utilized as a source of asphalt “mastic,” which is employed for footpaths, floors, roofs, &c. Excellent foundations for steam-hammers, dynamos and high-speed engines are made of asphaltic concrete. (B. R.)

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