Paper mulberry fibres in textile.

Among the fragments of miscellaneous fabrics attention may be called to a close-woven buff material, T. VI. b. i. 0013, in which Dr. Hanausek's careful analysis has recognized bast-fibres of some Moracea, 'most probably of the *Broussonetia papyrifera*, L., Vent.: the paper mulberry-tree of China and Japan'. The discovery of a textile from this fibre, which in view of the place of its find can safely be assigned to the first century B. C., is of considerable antiquarian interest. For it proves that when Ts'ai Lun in A. D. 105 made the memorable discovery of the first real paper, he had the textile use of the *Broussonetia papyrifera* bark to guide him to the employment of the same fibre in a macerated state.

Paper mulberry bark in early Chinese paper.

We know from Chinese sources that the bark of the paper mulberry-tree formed, together with hemp and old fishing-nets, one of the three materials which Ts'ai Lun used from the first for his new invention.[15] This bark has remained ever since the most common material for paper manufacture both in China and in Central Asia. It is, therefore, of importance to have definite proof furnished by the fabric from the refuse-heaps of T. VI. b that the fibres of the *Broussonetia papyrifera* had been utilized for textile purposes more than a century before Ts'ai Lun's invention. It is a fact illustrating once again the close connexion which Chinese attempts at the production of paper had, from their very start at an even earlier period, with the textile industries of the country.[16] And here I may note in passing that, with all the abundance of records at T. VI. b, not a single scrap of paper was found in the refuse deposits of the station. This fact furnishes a striking confirmation, albeit a negative one, for the accuracy of Chinese historical tradition concerning the invention of paper.

Stack of fascines for signal fires.

There still are left to be noticed the half-petrified remains of six stacks, built up of fascines and permeated with salt and coarse sand, which I found at intervals of 20–30 yards along the edge of the plateau to the east and south-east of the ruined station, and not far off. The fascines were neatly arranged in alternate layers consisting of thin Toghrak branches and reeds, the fascines in a layer being placed parallel to each other and crosswise to those of the layer next below and above. Whether made up of branches or of reeds, they averaged 7 feet in length, and the square stacks in which they had been neatly built up originally were of the same measure. Erosion and abrasion by wind-driven sand had reduced the stacks to a height varying from only a few inches to a foot or two. I had found similar and better preserved stacks before at other stations of the westernmost Limes, and it will be convenient later on to examine their character and exact purpose more fully.[17] Here it will suffice to point out that, as the material of the fascines manifestly indicates, the main purpose of their collection was use for lighting signal fires.

Optic telegraphy by fire-signals.

We shall have occasion further on to discuss the abundant documentary and other evidence which my explorations have yielded as to the extensive use, made along the whole line of the Limes, of the system of optic telegraphy by means of fire-signals, which is also attested by Chinese historical sources for different periods.[18] It is obvious that such readily inflammable materials were the best for sending up flares quickly, and that the adjoining jungle belts could supply them in abundance. It is of some local interest to find that the receipt and dispatch of fire-signals is repeatedly mentioned in the records of T. VI. b (see *Doc.*, Nos. 61, 84–7, 172), and also that the collection of small pieces of firewood is as one of the various 'fatigues' of the men at this station (*Doc.* No. 124).

terminal Tārīm is extensively used by the Lopliks for ropes, strings, etc., and forms a useful article of export to the oases on the west.

[15] Cf. Chavannes, *Les livres chinois avant l'invention du papier* (*J. Asiat.*, jan.–févr., 1905), pp. 5 sq.; also *Ancient Khotan*, i. p. 135 and the papers of Prof. J. v. Wiesner there quoted. To these must be added now the lucid explanations furnished by this distinguished scientist in his paper: *Über die ältesten bis jetzt aufgefundenen Hadernpapiere*, Sitzungsber. der K. Akademie der Wiss., Wien, 1911, pp. 3 sq., 8.

[16] Cf. Chavannes, *Les livres chinois*, etc., pp. 8 sqq. for the exact parallel furnished by the silk floss which was used for the production of a kind of paper earlier than Ts'ai Lun's invention.

As regards the earliest specimens of rag paper discovered at T. XII. a, see below, pp. 672 sqq.

[17] See below, pp. 677 sqq.

[18] Cf. below, Chap. XX. sec. vi.