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STUDIES IN THE HISTORY AND DEVELOPMENT OF THERMOGRAVIMETRY
V. A search for the Earliest Commercial Apparatus in the UK

C. J. Keattch

P.O.Box 9, Lyme Regis, Dorset DT7 3BT, UK

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Abstract

Several examples of the earliest commercial thermal analysis apparatus, the Talabot-Persoz-Rogeat Desiccator, are exhibited in various French museums and there is documentary evidence that at least twelve were exported to the UK in the late 19th Century.

This paper describes the search for extant examples in the UK.

Keywords: history, TG

Introduction

In May, 1979, during a fortuitous visit to the Musée de la Marine, Marseille, Hemminger [1] 'discovered' an example of what is almost certainly the oldest commercial thermal analysis instrument. Known as the 'Talabot-Persoz-Rogeat Desiccator', this apparatus was used to determine the dry weight of textiles, particularly silk, prior to commercial transactions. A black and white illustration (Fig. 1) and in particular, colour photographs, kindly supplied by Dr. Hemminger, reveal that the instrument was superbly constructed and lavishly embellished with enamel and gold leaf.

As a detailed description of the instrument has been given by Eyrand and Rochas [2], this account is concerned with its relation to the thermobalance, its application in the conditioning of silk and an attempt to trace any surviving instruments in the UK. It may, however, be appropriate first to look, very briefly, at the early history of the silk industry.

Origins of the Silk Industry

According to legend, the first silk was spun in China in about 2640BC by the Empress Si (Hsi)-ling-chi and woven into a robe for her husband, Huang-to. In

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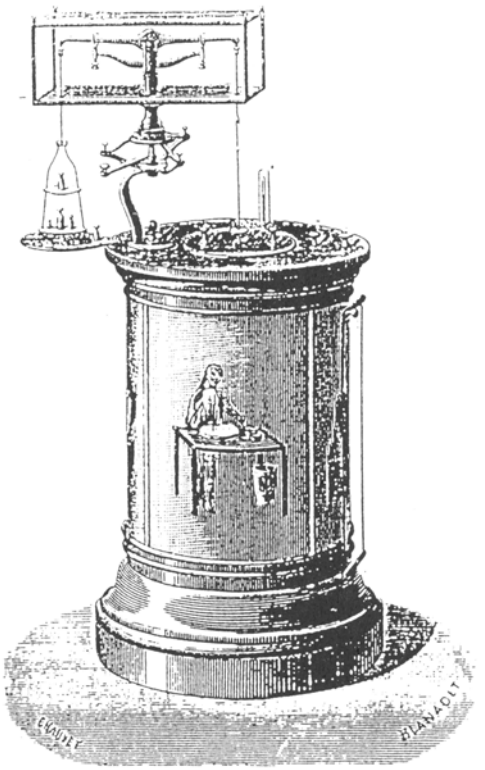

Fig. 1 The Talabot–Persoz–Rogeat (TPR) Desiccator

2200BC Shangtun province was offering payment in silk to a north Indian power, indicating that sericulture was well established in China, although its secrets were jealously guarded and disclosure meant certain death. Silk reached the West via the Silk Road, which commenced in Peking, thence to the Persian Empire before reaching Aleppo and the Levant. However, the secrets of sericulture spread very slowly, they did not reach Japan until 195AD and the Byzantine Empire in 550AD. By the ninth century sericulture had spread to Athens, whilst the Moors introduced it into Spain. In 1146 Roger of Sicily invaded Greece and brought back sericulturists and silk weavers to Palermo, whence the industry spread to northern Italy.

In France, the silk industry was not firmly established until Louis XI brought in Italian weavers, settling them in Lyon in 1480 [3].

Conditioning Houses

Silk is a notoriously hygroscopic material, which at ambient temperature, can contain between 8 and 15% moisture. From a commercial point of view, this property presents serious drawbacks, which can result in fraudulent prac-

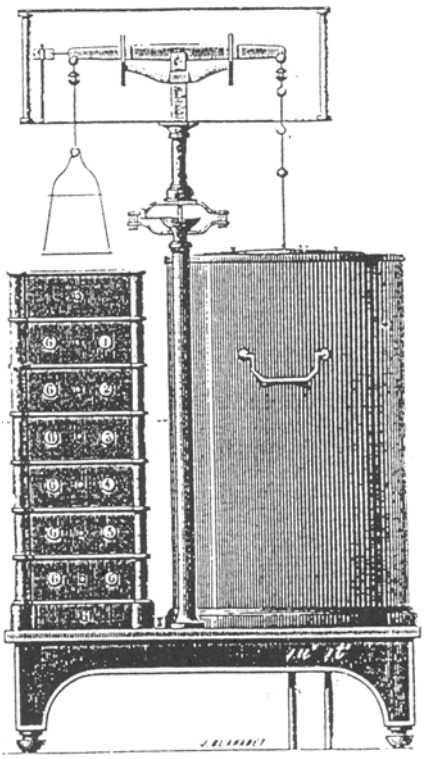

Fig. 2 The Talabot Apparatus

tices. In order to obviate the possibility of fraud 'Conditioning Houses' were established in which silk was brought to a so-called 'normal state' of moisture content under standard conditions of temperature and humidity, i.e. conditioned.

The first, rather crude Conditioning House was established in Turin in 1750. The raw silk was suspended from iron hooks inside a large room, well ventilated in summer and heated by open fires in winter. When the silk was conditioned, it was baled and weighed. Several private companies subsequently created more sophisticated Conditioning Houses, for example, in France, the first was opened in Lyon in 1779. However, the silk market was in such a state of confusion, brought about by, amongst other things, unscrupulous dealers, that in 1805 the Emperor Napolean decreed that Conditioning Houses be taken out of private ownership and placed under the sole control of the Lyon Chamber of Commerce. This body was reluctant to assume responsibility since it appreciated that the scientific problems of silk conditioning had yet to be solved. Nevertheless, towards the end of 1807, land was purchased for the purpose of building a Conditioning House. During the next decade or so many ideas re-

garding the best procedure for silk conditioning were proposed by several workers, foremost of these being Andrieu (1831) and Felissant (1832). However, a heating and ventilating engineer called Talabot concluded that the conditioned weight of a bale of silk could be deduced, with negligible error, from a representative sample of the bale suspended on a balance beam and heated to constant weight at 105–108°C in a suitable container. From this dried weight, the agreed conditioned weight (i.e. dry weight plus 9%) could be readily obtained.

The first device produced by Talabot (Fig. 2) employed steam heating and although successful, a few hundred grammes achieved constant weight only after about three hours heating because of the static air atmosphere employed. Use of a dynamic air flow, suggested by Prof. Persoz, reduced the drying time to about half an hour. The Lyon instrument manufacturer Rogeat was approached and thus the Talabot-Persoz-Rogeat (TPR) Desiccator, as shown in Fig. 1, was constructed.

The apparatus met with immediate success and was used from 1853 onwards for about 120 years without any major modifications [2, 4, 5]. The apparatus has been variously referred to as a 'thermobalance' [1] or an 'isothermal thermogravimetric apparatus' [2]. 'Thermobalance' is incorrect, since there is no facility for varying the temperature, whereas 'isothermal thermogravimetric apparatus', whilst correct, is rather clumsy. Perhaps a more suitable term would be 'recording balance', as typified by the apparatus produced by Stanton Redcroft in the 1960's [6], examples of which are, incidentally, still in use [7].

The Search for Talabot–Persoz–Rogeat Desiccators Extant in the UK

Within 20 years of its introduction, over 200 examples of the TPR Desiccator were in use in Europe [2]. According to Perret [4] 12 were exported to the UK, four to Manchester in 1850, and eight to London in 1852. Correspondence with the Institut Textile de France [8] indicates that a TPR Desiccator was exported to 'Society Gaddum'. This refers to the yarn merchants H. T. Gaddum & Co. Ltd., Macclesfield, who have a long history of dealings in silk, but according to the current Chairman, Mr. A. H. Gaddum, the Company, unfortunately, no longer possesses the Desiccator [9]. It is well documented that Conditioning Houses existed in Manchester and London towards the end of the 19th Century [10] and would seem to be one of the most likely places to house TPR Desiccators.

As far as Manchester is concerned, a Conditioning House existed in Mosley Street from 1858 to 1902 [11] but no records exist giving any information on the type of apparatus used. After that date, tests were made at the Manchester Chamber of Commerce Testing House, but a publication of theirs in 1913 [12] shows that the instrument used was not a TPR Desiccator but was

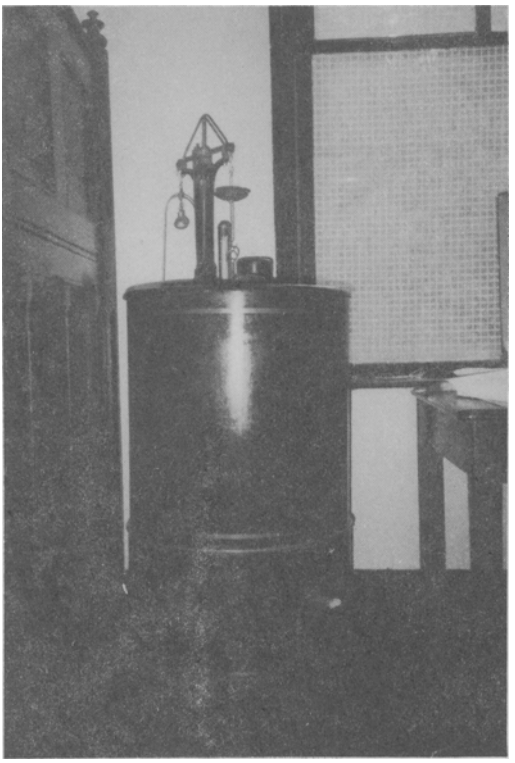

Fig. 3 The Nesbitt Moisture Tester

similar to the Nesbitt Moisture Tester (Fig. 3) [see later in this article]. An earlier (1903) edition of the above publication [13] also shows a similar apparatus.

Regarding Conditioning Houses in London, the Trade Silk Conditioning Company was established in 1858 at Alderman's Walk and continued at various addresses within the City of London until 1901, [14] when the business was transferred to the London & India Docks Co. [15], which, in 1909, was taken over by the Port of London Authority [16]. The testing was carried out in the well-known Cutler Street Warehouses and as Fig. 4 shows [17] these premises housed at least half of the eight TPR Desiccators sent from France in 1852.

The ultimate fate of these apparatuses is a mystery and the whereabouts of the remaining examples remain unsolved.

A comprehensive search of likely museums and other establishments throughout the UK has failed to find a single TPR Desiccator, neither is there any mention in a recently published inventory of scientific instruments [18].

There are, however, examples of moisture testers of more recent vintage from British manufacturers in at least two museums in the UK. An example of the Nesbitt Moisture Tester (Fig. 3) is in the Helmshore Textile Museums,

Fig. 4 TPR Desiccators in the Cutler Street Warehouses

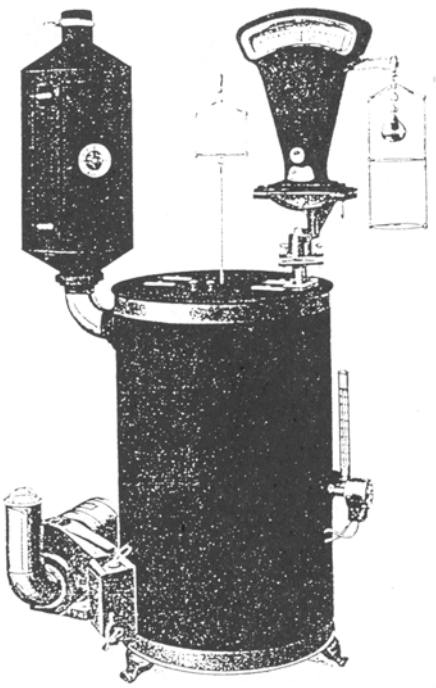

Fig. 5 Goodbrand's Moisture Testing Oven

Rossendale, Lancashire. This particular apparatus was used for conditioning cotton samples and manufactured by John Nesbitt, Manchester.

The date of manufacture is not known exactly, but would have been circa 1930. The entry in the museum's Acquisition Book merely states 'bought at auction on closure of mill'. The name of the mill is not given, neither is the date of acquisition nor the price paid at auction.

Another example of British manufacture is the Moisture Testing Oven (or Cotton Testing Oven) housed in the Bradford Industrial Museum (Fig. 5). This more sophisticated apparatus was manufactured by Goodbrand & Co. Ltd., Stalybridge, Lancashire in the early 1950's. It was acquired by the museum in late 1972 from Carrington Viyella, Atherton, Lancashire.

Whilst both these examples are of historical interest, it is clear from the illustrations that they do not match the craftsmanship and opulence of the Talabot–Persoz–Rogeat apparatus, examples of which are still proudly displayed in several museums throughout France, but sadly, none in the UK.

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Zusammenfassung — Einige Exemplare des ersten kommerziellen Thermoanalysegerätes, des Talabot-Persoz-Rogeat Exsikkators, sind in verschiedenen französischen Museen ausgestellt und es gibt dokumentarisch belegte Beweise dafür, daß Ende des 19. Jahrhunderts mindestens zwölf davon nach Großbritannien exportiert wurden.
Vorliegende Arbeit beschreibt die Suche nach noch vorhandenen Exemplaren in Großbritannien.