
SILKEN CHEMISTRY.

THE assay of gold and silver has already been described in this miscellany, and most persons are familiar with analyses of various minerals and vegetables, made with a view of ascertaining and determining their relative degrees of purity. But a method by which such a delicate fabric as silk is capable of being assayed; of being put through a fire and water ordeal, flung into a crucible, and brought out free from all impurities, is a novelty of a rather startling nature; for who ever dreamt that silk is adulterated?

Silk is, from its nature, more susceptible of absorbing moisture than any other fibrous article. In fact, it approaches in this respect to the quality of sponge: well-dried silk, when placed in a damp situation, will very rapidly absorb five or six per cent. of moisture; and, being very dear and being always sold by weight, this property gives large opportunity for fraud; yet it is not the only channel for mal-practices. Silk, as spun by the silk-worm, contains amongst its fibres, in very minute portions, a quantity of resin, sugar, salt, &c, to the extent generally of twenty-four per cent. of the entire weight.

This peculiarity leads to the fraudulent admixture of further quantities of gum, sugar, and even of fatty substances, to give weight to the article; consequently when a dealer or manufacturer sends a quantity of raw silk to a throwster to be spun into silk thread, it is no unusual thing to find it heavily charged with adulterate matters. When he sends that silk to be dyed he will find out the loss, provided the dyer does not follow up the system by further adulteration.

The presence of foreign substances in the silk, is fatal to proper dyeing; hence the dyer proceeds to get rid of them by means of boiling the silk in soap and water. As silk thread becomes charged with foreign matters to various degrees, given weights of several samples will contain very different lengths. In this way manufacturers are often deceived in the produce of various parcels of thrown silks after coming from the loom.

In our own country, great as have been the strides made by most branches of manufacture, the silk spinner or weaver has quietly borne all these evils and disappointments in deepest ignorance of the Chemistry of Silk, and perhaps believing that "Where ignorance is bliss, 'tis folly to be wise." He, alone, of all the workers, has neglected to seek the friendly aid of the chemist.

Possibly it is this indifference to science, which has left the silk manufacturer so far behind every other son of industry. It is notorious that, whilst our cotton, linen, and woollen manufactories have been multiplied ten-fold during the last score of years, those of silk goods have made scarcely any progress. The manufacturers are themselves perfectly aware of this startling fact, and it was but a few months since that a memorial was presented from them to the legislature, praying that all remaining protection on their goods might be removed, as the only hope of giving a new vitality to their slumbering trade.

The truth is, that Frenchmen are more keenly alive to the value of science in connection with manufacture than ourselves. Whilst our silk manufacturers have gone on upon the old well-beaten track, those of France have enlisted in their behalf the services of the chemist, who has brought their raw material as completely under his analytical control as subtle gas or ponderous ore. He has demonstrated to a nicety that its relative purity, its strength, its elasticity, its durability, its structure, the very size and weight of each separate fibre, may be shown and registered with precision and certainty. He tells the manufacturer the actual amount of latent moisture contained in a pound of silk; he shows him how much natural gum, resin, and sugar, every bale comprises; he points out how much lighter his thread should be after the processes of spinning and dyeing; and, more valuable still, he indicates the most profitable use to which every bale of raw silk is applicable: that whilst one parcel is best adapted for the manufacture of satin, another may be better employed for plain silk, another for velvet, and so on to the end.

In France, Italy, and other parts of continental Europe, the assaying, or, as it is there technically termed, the "conditioning of silk," is carried on under the sanction of the municipal authorities, in establishments called Conditioning Houses. The quantity thus assayed is published weekly for the information of the trade with as much regularity as

a Price Current. In this way we may find it publicly notified that, in the Conditioning House at Lyons there were during last year five millions, thirty-seven thousand, six hundred and twenty-eight pounds of silk assayed; at Milan, three millions, four hundred and sixty-six thousand, six hundred and ninety-one pounds, and other large quantities at St. Etienne, Turin, Zurich, Elberfeld, and other places.

Of so much importance has this process been deemed in France that, in 1841, a royal *ordonnance* was passed, setting forth the ascertained weight which silk loses by the conditioning process, and which is eleven per cent. This eleven per cent., added to the weight of the silk after the ordeal it has gone through, makes up what is termed its merchantable weight.

The French have brought to our doors the means of accomplishing what they have practised during the last twenty years, with so much advantage. These means are no further removed from us than Broad Street Buildings, in the City, in premises lately occupied by one of the many Colonial bubble Companies which have so multiplied during the past half century. Science has established herself where humbug so recently sat enthroned.

We have paid a visit to these premises. The first operation we beheld was that of determining the humidity of silk. Eleven per cent. is the natural quantity in all silk, but from various causes this is nearly always much exceeded. Several samples of the articles having been taken from a bale, they are weighed in scales, capable of being turned by half a grain. Two of these samples are then placed in other scales, equally delicate and true; one end of which, containing the sample, being immersed in a copper cylinder heated by steam to two hundred and thirty degrees of Fahrenheit, the other, with the weights, being enclosed within a glass case. The effect of this hot-air bath is rapidly seen; the silk soon throws off its moisture, becomes lighter, and the scale with the weights begins to sink. In this condition it is kept until no further loss of weight is perceived;—the weight which the silk is found to have lost being the exact degree of its humidity. The natural eleven per cent. of humidity being allowed for, any loss beyond that shows the degree of artificial moisture which the silk contains.

To determine the amount of foreign matters contained in a sample of silk, the parcels—after a most mathematical weighing—are boiled in soap and water, for several hours. They are then conveyed to the hot-air chambers, subjected to two hundred and thirty degrees of heat, and finally weighed. It will be found now that silk of the greatest purity has lost not only its eleven per cent. of moisture, but a further twenty-four per cent. in the various foreign matters boiled out of it. But

should the article have been in any way tampered with, the loss is not unusually as much as thirty or thirty-two per cent.

The assaying the lengths of silk is done by ruling off four hundred yards of the fibre, and weighing that quantity; the finer the silk, the lighter will these four hundred yards be. But as this gossamer fibre is liable to break, a beautiful contrivance exists for instantly arresting the reel on which it is being wound off, in order that it may be joined and the reeling continued. Another means exists for stopping the reel immediately the four hundred yards are obtained.

The degree of elasticity is shown by a delicate apparatus which stretches one thread of the silk until it breaks, a tell-tale dial and hand marking the point of fracture. Equally ingenious and precise is the apparatus for testing what is termed the "spin" of the silk;—its capability of being twisted round with great velocity without in any way being damaged in tenacity or strength.

The last process is also purely mechanical. A hank of the silk, on its removal from the boiling-off cistern, is placed upon a hook; and, by means of a smooth round stick passed through it, a rapid jerking motion is given to it, which after some little time, throws up a certain degree of glossy brightness. This power of testing its lustre is employed to ascertain its suitability for particular purposes. Should it come up very brilliantly, the article will be pronounced adapted for a fine satin; with less lustre upon it, it may be set aside for gros de Naples, or velvet, and in this way the manufacturer can determine beforehand to what purpose he shall apply his silk, and so avoid frequent disappointment and loss. In short, instead of working in the dark and by chance, he works by chemical rules of undeviating correctness.

After each of the above assays, or conditionings, the owner of the silk is supplied for a small fee with an authenticated certificate of its various qualities.