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P.W. Tomkins

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be consumed in $\frac{1}{50000}$ th of a second: and as a candle may be seen in a dark night, the air being clear, at the distance of five miles, a sphere of ten miles in diameter, containing 523 cubic miles, is filled with light in $\frac{1}{50000}$ th part of a second.

But as the heat of a candle cannot produce any sensible effect at a greater distance than a few yards, we may suppose that heat is specifically heavier than light. Oxygen gas is heavier than hydrogen gas in the ratio of 15 to 1, because the former contains more water than the latter. Let it, therefore, be supposed that the quantities of matter contained in light and heat be in the ratio of 1 to 15, which appears to be considerably within the bounds of probability, then a quantity of matter of about $\frac{1}{30000}$ th* part of a grain may be so attenuated and modified by the elements of combustion, thermogen and photogen, as to fill a space = 523 cubic miles in $\frac{1}{50000}$ th part of a second of time.

Hence we see that, although matter is passive and inert, yet, by being acted upon by the invisible imponderable elements, it is made to put on an infinite variety of new forms, without a single atom being lost. And the wonderful effects which are thus produced on the living functions of animals, and vegetables, is a field of investigation that is almost boundless.

Lynn, May 12, 1814.

E. WALKER.

[To be continued.]

LXXIV. *Process for preparing, with a Description of some of the Properties of, the refined Ox Gall, invented and prepared by PELTRO WILLIAM TOMKINS, Esq. Historical Engraver to Her Majesty, No. 53, New Bond-Street, London*†.

OX GALL deprived of its tendency to putridity, and its colouring matter, so detrimental to all delicate colours, is prepared in the following manner:

Process.

To a pint of fresh ox gall, boiled and skimmed, put one ounce of alum, finely powdered; continue it on the fire until combined; when cold, put it into a bottle, and cork it moderately close.

To another pint of fresh ox gall, also boiled and skimmed,

$$* \frac{1}{15} \text{ of } \frac{1}{200} = \frac{1}{3000}$$

† The above is accompanied in the *Transactions of the Society of Arts* for 1813, whence we have copied it, with numerous certificates from our first artists, all concurring in the valuable properties of the refined ox gall. The lesser gold medal of the Society was voted to Mr. Tomkins for his communication.

put

put one ounce of common salt, and continue it on the fire until combined; when cold, put it into another bottle, and cork it moderately close.

Gall, thus prepared, will keep perfectly free from putridity, or any offensive smell, for years.

When the above preparations have stood in a room, of a moderate temperature, for about three months, they will deposit a thick sediment, become clear, and fit for use in ordinary purposes; but as they contain a large portion of yellow colouring matter, tingeing blue of a greenish hue, reds, brown, and sullyng purples, they are unfit for general use in painting in water colours.

Further Process.

The before-mentioned preparations, after standing until become perfectly clear, are to be decanted and combined in equal proportions; a thick coagulum is instantly formed of the yellow colouring matter, which precipitates, leaving a clear liquid, namely, the colourless ox gall.

N. B. After the combination of the two first preparations, the process may be assisted by filtering the liquid through paper. Age renders this preparation more brilliantly clear, and by it, it seems to obtain an agreeable scent; nor has it been observed to contract, at any time, an unpleasant smell, or to lose its useful properties.

Properties.

The refined ox gall possesses all the valuable properties of ox gall, as applicable to painting in water colours, with the superior advantages of being deprived of all tendency to putridity, and of all colouring matters.

It combines with, and fixes, all water colours, as they are usually prepared, either by being mixed with them, or washed over them after they are laid upon the paper, &c. It renders blue, purple, red, green, and all other delicate colours, more bright and durable; and, if a small portion of it be added to any of the colours, it causes them to wash more freely and evenly over the surface of the paper, ivory, &c.

Combined with gum arabic, it gives depth of tint, without any unpleasant glossiness upon the surface of the drawing, and prevents the gum from cracking; and the colours are so completely fixed in the paper itself, that subsequent tints can be washed over them without any risk of their becoming foul, or forming improper combinations with the under colours.

Combined with fine lamp black, and gum water, it forms a complete substitute for Indian ink.

If it be floated over the surface of drawings made with chalks,
or

or black-lead pencil, it fixes them firmly; and they may then be washed over with any water colours, previously mixed with a portion of it, without in the least degree disturbing the chalks or black-lead.

For miniature painting, being washed over the surface of the ivory, it completely removes its greasiness; and being mixed with the colours, it causes them to float freely thereon, and tints may be laid over tints, the colours being struck into the ivory.

For transparencies, oiled paper, being first washed over with the refined ox gall, and permitted to dry, water colours, mixed with some of it, will lie freely, and perfectly smooth upon it, and be so fixed, as not to wash up by the repetition of different glazings of colours, over each other; thus producing depth of colour.

In short, the valuable properties this refined ox gall possesses, make it equally applicable to historical, landscape, botanical, and natural history painting, as well as to colouring prints in general; and, by its readily combining with all the vehicles used in the preparation of water colours, and having no colour in itself, it enables the artist to paint with ease on surfaces otherwise unfavourable, at the same time rendering the colours more bright and durable.

Many other valuable properties will, no doubt, on trial, be found in this preparation; and the result cannot fail to facilitate and improve the art of painting in water colours; and, as the discovery of it is entirely new, it will in all probability be found applicable to many other useful purposes.

May 20, 1812.

P. W. TOMKINS.

LXXV. *Memoir upon the Causes of the long Duration of the Chinese Empire. Read to the Philotechnic Society, 2d of May 1813. By M. PAGANEL, Member of several learned Societies*.*

IN order to confine my subject within the bounds which circumstances require, I shall rapidly run over the traits which characterize all the nations of antiquity, and which distinguish them from those of Europe. Passing afterwards from these general considerations to the particular character of the Chinese, it will be acknowledged that this ancient nation is not less distinct from those who occupy the opposite extremity of Asia, than the latter are from the Hungarians and Germans.

Institutions in general derive their chief force from local conveniences; that is to say, from the concordance between those

* *Mugazin Encyclopédique*, 1813, tome iv. p. 88.

institutions