



# V. Demonstration of the rule of Descartes

Mr. Septimus Tebay

To cite this article: Mr. Septimus Tebay (1844) V. Demonstration of the rule of Descartes, Philosophical Magazine Series 3, 24:156, 24-25, DOI: [10.1080/14786444408644794](https://doi.org/10.1080/14786444408644794)

To link to this article: <http://dx.doi.org/10.1080/14786444408644794>



Published online: 30 Apr 2009.



Submit your article to this journal [↗](#)



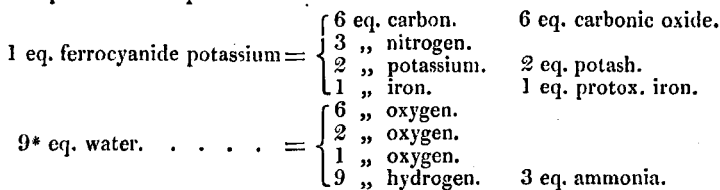
Article views: 3



View related articles [↗](#)

## 24 Mr. S. Tebay's *Demonstration of the Rule of Descartes.*

oxide, 3 equivalents of ammonia, 2 equivalents of potash, and 1 equivalent of protoxide of iron.



At a subsequent period, when the evolution of carbonic oxide ceases and the temperature rises very high, the iron becomes peroxidized at the expense of a portion of the acid, sulphurous acid is emitted, and the iron-alum gradually formed, the excess of alkaline sulphates remaining in solution.

In conclusion, it may be worth while calling the attention of those whom it may concern to the foregoing experiments, as furnishing an extremely easy and economical method of preparing carbonic oxide for purposes of research or demonstration. A single half-ounce of the yellow salt treated with some oil of vitriol in a common Florence flask fitted with a perforated cork and conducting tube, gives more than 300 cubic inches of gas, which has all the marks of the most perfect purity: it does not in the least affect lime-water, and becomes entirely converted into carbonic acid by explosion with half its volume of oxygen. The gas given off during the whole of the reaction is equally pure, except quite at the end of the operation, when, as before noticed, a little sulphurous acid appears.

### V. *Demonstration of the Rule of Descartes.*

By Mr. SEPTIMUS TEBAY of Preston.

*To the Editors of the Philosophical Magazine and Journal.*

GENTLEMEN,

I TAKE the liberty of sending you the following simple method which recently occurred to me of demonstrating the rule of Descartes.

Let  $x = v$  be any equation, and  $X_1, X_2, X_3$ , &c. the first, second and third, &c. limiting polynomials derived from  $X$ . Let the roots of the equations  $X = 0, X_1 = 0, X_2 = 0$ , &c., written in descending order, be represented by  $a_1, a_2, a_3 \dots, b_1, b_2, b_3 \dots, c_1, c_2, c_3 \dots$ , &c. respectively, these numbers being known to arrange themselves as follows:—

\* Probably 6 eq. from the oil of vitriol, the acid of which has combined with the ammonia, potash and oxide of iron, and 3 eq. being the water of crystallization of the salt.

$$\begin{array}{ccccccc} a_1 & a_2 & a_3 & \cdot & \cdot & \cdot & \\ & b_1 & b_2 & b_3 & \cdot & \cdot & \cdot \\ & & c_1 & c_2 & c_3 & \cdot & \cdot & \cdot \\ & & & \cdot & \cdot & \cdot & \cdot & \cdot \end{array}$$

Let  $X_m$  and  $X_{m+1}$  be any two consecutive limiting polynomials; then, since  $X_m$  and  $X_{m+1}$  have like and contrary signs immediately before and after the passage of a root of the equation  $X_m = 0$  (Young on Equations, art. 76), it is manifest, by inspecting the above arrangement of the roots, that one variation, and only one, will be introduced on the passage of each root of the equation  $X = 0$ ; the value of  $x$  being supposed to continually decrease from the greatest root downwards. Now, since all the positive roots are comprised between 0 and  $\infty$ , it follows, from what is proved above, that the number of variations arising from making  $x = 0$  will exhibit the number of positive roots in the equation; which variations, it is manifest, are the same, both in number and order, as those of the original equation.

It is proved in exactly the same manner as above, the value of  $x$  being supposed to increase from the least root upwards, that no equation can have a greater number of negative roots than permanencies, or successive repetitions of the same sign.

*Cor.*—It is also plain that, if any two numbers be substituted for  $x$  in the functions  $X, X_1, X_2, X_3$ , &c., the difference between the number of variations, in the signs of the results of these substitutions, will express exactly the number of roots comprised between these two numbers.

Yours, &c.,

Preston, November 5, 1843.

SEPTIMUS TEBAY.

---

VI. *Observations on the Notations employed in the Differential and Integral Calculus.* By J. J.\*

**T**HE differential and integral calculus are applied to nearly the whole circle of the physical sciences; scarcely any treatise on mechanics, optics, astronomy, &c. can be read so as to be understood without a thorough knowledge of these extensively useful adjuncts, or at all events without a pretty close acquaintance with them. It is clearly expedient then that sciences so generally applied and so constantly occurring should be kept as simple as possible. The symbols employed should be as free as they can be from ambiguity, at the same

\* Communicated by the Author.