120.

NOTE ON A GENERALIZATION OF A BINOMIAL THEOREM.

[From the *Philosophical Magazine*, vol. VI. (1853), p. 185.]

THE formula (*Crelle*, t. I. [1826] p. 367) for the development of the binomial $(x+\alpha)^n$, but which is there presented in a form which does not put in evidence the law of the coefficients, is substantially equivalent to the theorem given by me as one of the Senate House Problems in the year 1851, and which is as follows:—

"If $\{\alpha+\beta+\gamma\ldots\}^p$ denote the expansion of $(\alpha+\beta+\gamma\ldots)^p$, retaining those terms $N\alpha^a\beta^b\gamma^c\delta^d\ldots$ only in which $b+c+d\ldots$ is not greater than $p-1$, $c+d+\ldots$ is not greater than $p-2$, &c., then

$$\begin{aligned} x^n = {} & 1 \qquad\qquad\qquad\qquad (x+\alpha)^n \\ & -\frac{n}{1}\{\alpha\}^1 \qquad\quad (x+\alpha+\beta)^{n-1} \\ & +\frac{n(n-1)}{1.2}\{\alpha+\beta\}^2 \quad (x+\alpha+\beta+\gamma)^{n-2} \\ & -\frac{n(n-1)(n-2)}{1.2.3}\{\alpha+\beta+\gamma\}^3\,(x+\alpha+\beta+\gamma+\delta)^{n-3} \\ & + \&c." \end{aligned}$$

The theorem is, I think, one of some interest.