But the difference of the line-integrals $I_2 - I_1$ is the line-integral around the closed contour 21, so that we have the line-integral of the tangential component of the vector P around the closed contour proved equal to the surface-integral, over a surface bounded by the contour, of the normal component of a vector Ω whose components are

$$\omega_1 = h_2 h_3 \left\{ \frac{\partial}{\partial \rho_2}\left(\frac{P_3}{h_3}\right) - \frac{\partial}{\partial \rho_3}\left(\frac{P_2}{h_2}\right) \right\},$$

$$\omega_2 = h_3 h_1 \left\{ \frac{\partial}{\partial h_3}\left(\frac{P_1}{h_1}\right) - \frac{\partial}{\partial \rho_1}\left(\frac{P_3}{h_3}\right) \right\},$$

$$\omega_3 = h_0 h_2 \left\{ \frac{\partial}{\partial \rho_1}\left(\frac{P_2}{h_2}\right) - \frac{\partial}{\partial \rho_1}\left(\frac{P_1}{h_1}\right) \right\}.$$

The vector Ω is called the *curl* of P.

ON THE STEINER POINTS OF PASCAL'S HEXAGON.

BY DR. VIRGIL SYNDER.

THE proof given by v. Staudt* of the conjugate nature of M, N with regard to the conic for which M, N are associated Steiner points is perhaps rigorous, but unnecessarily long, and the most important statement† is only proved for the particular case in which the two triads of points defining the hexagon are linearly perspective.

He gives a second proof in article 8 of the same paper which is much shorter, but involves imaginary elements.

The following proof is much more simple and direct than either, and shows clearly which of Steiner's points are associated as "Gegenpunkte."

Let A_1, A_2, A_3 and B_1, B_2, B_3 be two triads of points lying on the same conic; these points can be made projective in six ways, namely

$$\begin{pmatrix} A_1A_2A_3 \\ B_1B_2B_3 \end{pmatrix} \quad \begin{pmatrix} A_2A_3A_1 \\ B_1B_2B_3 \end{pmatrix} \quad \begin{pmatrix} A_3A_1A_2 \\ B_1B_2B_3 \end{pmatrix}$$

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* Ueber die Steiner'schen Gegenpunkte * * *, *Crelle's Journal*, vol. 62.

† "Weil ferner P, Q harmonïsch getrennt sind durch M und seine Polare * * *."