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ON QUATERNIONS AND THEIR GENERALIZATION AND THE  
HISTORY OF THE EIGHT-SQUARE THEOREM. ADDENDA.

BY L. E. DICKSON.

H. Scheffler\* gave an erroneous 16-square formula

$$(\Sigma a_i^2)(\Sigma b_i^2) = \Sigma A_i^2, \quad A_3 = a_8b_6 - a_{15}b_{13} + \dots, \quad A_{12} = -a_8b_{13} + a_{15}b_6 + \dots,$$

whence  $\Sigma A_i^2$  has the term  $-4a_8a_{15}b_6b_{13}$ . The sign  $+$  before  $a_{15}b_{16}$  in  $A_2$  is probably a misprint as it causes many cases of failures of the formula.

S. A. Corey communicated privately a special 16-square formula. In his identity† take  $c_1 = c_2 = 1$  and let  $t_{2n-1}$  be conjugate to  $t_{2n}$  and  $r_{2n-1}$  conjugate to  $r_{2n}$ . Then  $2S_8S_8' = S_{16}$ , where  $S_r$  denotes a sum of  $r$  squares. Evidently  $2S_8 = S_8 + S_8 = S_{16}'$ . As each of the numbers the sum of whose squares is  $S_8'$  take the hypotenuse of a right triangle, whence  $S_8' = S_{16}''$ . Thus  $S_{16}'S_{16}'' = S_{16}$ .

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\* Die Polydimensionalen Grössen und die Vollkommenen Primzahlen, Braunschweig, 1880, p. 94.

† Amer. Math. Monthly, 26, 1919, 72.