s must be commutative with at least one of the substitutions of H besides identity. If a transitive group of degree n is transformed into itself by any substitution in the same letters and if the degree of this substitution is not $n - 1$, then it must be commutative with at least one of the substitutions of the transitive group besides identity.

7. The object of Professor Allardice's note on the cyclide of Dupin was to show that, by means of a transformation originally due to Laguerre (see Darboux, Théorie des surfaces, volume 1, page 253), a circle may be transformed into this cyclide; and that the principal properties of the surface may be obtained geometrically by means of the transformation.

8. The relation between the radii and distance between centers giving the condition that two circles may have a simultaneously in- and circumscribed quadrilateral was obtained by various mathematicians (Fuss, Steiner, Jacobi, Cayley) in a form limited to a special case. The complete formulas are found by Dr. McDonald, incidentally giving the interpretation of certain results of the theory of elliptic functions.

9. Professor Dickson's paper appears in full in the present number of the BULLETIN.

W. A. MANNING,
Secretary of the Section.

ON QUADRATIC FORMS IN A GENERAL FIELD.

BY PROFESSOR L. E. DICKSON.

(Read before the San Francisco Section of the American Mathematical Society, September 28, 1907.)

1. WE investigate the equivalence, under linear transformation in a general field F, of two quadratic forms *

$$q \equiv \sum_{i=1}^{n} a_i x_i^2, \quad Q \equiv \sum_{i=1}^{n} \alpha_i X_i^2 \quad (a_i \neq 0,\ \alpha_i \neq 0).$$

An obvious necessary condition is that α_1 shall be representable by q, viz., that there shall exist elements b_i in F such that

$$\alpha_1 = \sum_{i=1}^{n} a_i b_i^2.$$

* Within any field F, not having modulus 2, any quadratic form of non-vanishing determinant is equivalent to one of type q.