

## 9. ELECTRICAL MACHINERY AND APPARATUS

### A. DIRECT-CURRENT MACHINES

#### AN EXPERIMENTAL METHOD OF STUDYING THE DYNAMO MACHINE

C. F. Brackett

Vol. i—1884, pp. 1-3, paper No. 7

Description of a method of explaining the magnetic field of an experimental generator, designed to show the effect of iron in the armature core and that of current in the armature winding.

*Discussion*, pp. 3-4, by Messrs. N. S. Keith, C. F. Brackett and E. A. Sperry.

#### THE PRACTICAL REQUIREMENTS OF SMALL MOTORS

S. S. Wheeler

Vol. iv—1887, pp. 58-65

Discussion of requirements of small electric motors. Discussion of a new design of small direct current motor with gramme ring armatures.

*Discussion*, pp. 65-82, by Messrs. Sidney F. Shelbourne, ———Diehl, G. W. Mansfield, ——— Wing, C. S. Bradley, S. S. Wheeler, C. O. Mailloux, J. M. Pendleton, ———Curtis, T. C. Martin, G. A. Hamilton and Jos. Wetzler.

General remarks on battery fed motors for sewing machines, fans, etc.; the requirements of the service and characteristics of commercial equipments.

#### THE RELATION BETWEEN THE CROSS-SECTION OF THE IRON IN THE ARMATURE AND FIELD OF THE GRAMME DYNAMO

Dugald C. Jackson

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*Discussion*, pp. 154-160, by Messrs. S. S. Wheeler, Elihu Thomson and C. O. Mailloux.

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#### ELECTRIC MOTOR REGULATION

Francis B. Crocker

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*Discussion*, pp. 252-263, by Messrs. Townsend Wolcott, Francis B. Crocker, Edward Weston, S. S. Wheeler, Joseph Wetzler, C. O. Mailloux, E. P. Roberts, E. L. Nichols, and Elihu Thomson.

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*Discussion*, pp. 201-213, by Messrs. W. A. Anthony, A. Langstaff Johnson, F. C. Crocker, W. J. Hammer, Edward P. Thompson, Edw. C. Boynton, Jr., C. O. Mailloux, S. S. Wheeler, J. Martin and Thos. D. Lockwood.

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**ON THE RELATION OF THE AIR GAP AND THE SHAPE OF THE POLES TO THE PERFORMANCE OF AUTOMATIC ELECTRIC MACHINERY**

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*Discussion*, pp. 467-480, by Messrs. T. D. Lockwood, W. A. Anthony, Townsend Wolcott, C. O. Mailloux, J. Stanford Brown and Nikola Tesla.

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**ELECTRIC RAILWAY MOTOR TESTS**

George B. Shepardson and Edward P. Burch

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*Discussion* (including that of paper by N. W. Perry on "Series Electric Traction" and paper by H. Ward Leonard on "A New System of Electric Propulsion"), pp. 595-600 and 761-793, by Messrs. Frank J. Sprague, C. E. Emery, C. S. Bradley, E. F. Thomas, H. Ward Leonard, C. T. Hutchinson, C. O. Mailloux, F. B. Crocker, Charles Hewitt and F. V. Henshaw.

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**MICANITE, AND ITS APPLICATION TO ARMATURE INSULATION**

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*Discussion*, pp. 811-823, by Messrs. W. J. Hammer, W. A. Anthony, Carl Hering, Charles W. Jefferson, R. W. Pope, F. B. Crocker, E. P. Thompson, L. W. Kingsley, C. P. Steinmetz, J. B. Williams and A. E. Kennelly.

General remarks on the characteristics and testing of insulation.

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**HEATING OF ARMATURES**

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*Discussion*, pp. 423-429, by Messrs. Carl Hering, F. B. Crocker, William Stanley and A. E. Kennelly.

General remarks on acyclic generator design.

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*Discussion*, pp. 460-464, by Messrs. C. N. Black and C. P. Steinmetz.

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**RELATIVE ADVANTAGES OF TOOTHED AND SMOOTH CORE ARMATURES**

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*Discussion*, pp. 469-475 and 637-638, by Messrs. A. E. Wiener, C. P. Steinmetz, Gano S. Dunn, William Stanley, C. N. Black, A. E. Kennelly, and A. D. Adams.

General remarks on relative advantages of toothed and smooth cores as to leakage, flux distribution, commutation, armature reaction, etc. Toothed vs. smooth armature with regard to sparking.

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*Discussion*, pp. 20-33, by Messrs. Francis B. Crocker, Richard Fleming, Samuel Sheldon, A. E. Kennelly, Gano S. Dunn, James Burke, W. L. Bliss, Alton D. Adams, Mr. Edson, B. J. Arnold, L. L. Summers and C. A. Pratt.

Relative advantages of cast steel and wrought iron for field pole construction.

**A METHOD OF PREVENTING ARMATURE REACTION**

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Description of the design, construction and performance of several d. c. generators equipped with an auxiliary pole face winding for compensating armature reaction. Design data, flux distribution curves and other experimental results.

*Discussion*, pp. 109-128, by Messrs. Townsend Wolcott, W. L. Bliss, E. A. Merrill, Cary T. Hutchinson, Chas. S. Bradley, C. O. Mailloux, Charles E. Emery, A. E. Kennelly, Gano S. Dunn, Maxwell M. Mayer, Harris J. Ryan, B. J. Arnold, A. V. Abbott, W. M. Stine, C. E. Kammerer, Prof. Fortenbaugh, L. L. Summers, Mr. Cochrane, O. S. Lyford, Jr., and Ludwig Gutmann.

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Clarence E. Gifford Vol. xii—1895, pp. 260-267

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**COMPOUNDING DYNAMOS FOR ARMATURE REACTION**

Elihu Thomson Vol. xii—1895, pp. 288-297

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*Discussion*, pp. 387-399, by Messrs. G. S. Dunn, C. T. Hutchinson, F. A. Pattison, James Burke, C. P. Steinmetz, R. T. Lozier, William Elmer, Jr., H. Ward Leonard and E. R. Carichoff.

General remarks on the efficiency and economics of the Ward Leonard system of motor control.

**SPARKING, ITS CAUSE AND EFFECTS**

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*Discussion*, pp. 591-606, by Messrs. C. P. Steinmetz, Gano S. Dunn, Thorburn Reid, A. E. Kennelly and Wm. E. Geyer.

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**AIR-GAP AND CORE DISTRIBUTION**

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*Discussion*, pp. 446-447, by Messrs. J. B. Blood and C. A. Adams.

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*Discussion*, pp. 481-483, by Messrs. C. P. Steinmetz, J. B. Blood and W. E. Goldsborough.

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*Discussion*, pp. 604-606, by Messrs. A. E. Kennelly, George F. Sever, E. J. Willis, George Hill and C. O. Mailloux.

B. SYNCHRONOUS MACHINES

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Louis Duncan and W. F. C. Hasson

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*Discussion*, pp. 118-127, by W. A. Anthony, Nikola Tesla, H. Ward Leonard, S. S. Wheeler, Louis Duncan, O. T. Crosby, Frederick Darlington, John Millis, Townsend Wolcott, M. I. Pupin and J. B. Entz.

General remarks on transformer design. Comparative efficiency of direct-current with alternating-current distribution system.

INVESTIGATION OF THE STANLEY ALTERNATE CURRENT ARC DYNAMO

W. B. Tobey and G. B. Walbridge

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Description of the Stanley arc generator and of performance tests at different loads. Curves of e. m. f., current, power and exciting current taken by point-by-point method for different loads. E. m. f. characteristic of carbon arc.

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**A NEW METHOD OF ANALYZING THE MAGNETIC REACTIONS OF ARMATURES APPLIED TO THE STANLEY ARC-LIGHT ALTERNATING CURRENT MACHINE**

Thorburn Reid

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*Discussion* (including that of paper by Messrs. W. B. Tobey and G. B. Walbridge on "Investigation of the Stanley Alternate Current Arc Dynamo"), pp. 391-406, by Messrs. William Stanley, Jr., A. E. Kennelly, R. W. Pope, Thomas D. Lockwood, E. T. Birdsall, W. B. Tobey, Charles P. Steinmetz, Thorburn Reid, C. O. Mailloux, M. I. Pupin, Cary T. Hutchinson, T. C. Martin, S. S. Wheeler, Geo. M. Phelps and W. E. Geyer.

General remarks on calculation of regulation of arc machines. Motion to support Electrical Industries Census bill before Congress.

**A NEW METHOD OF ANALYZING ARMATURE REACTIONS OF ALTERNATORS**

Charles P. Steinmetz

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*Discussion*, pp. 439-445, by Messrs. Thorburn Reid and Charles P. Steinmetz.

**A STUDY OF AN OPEN COIL ARC DYNAMO**

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*Discussion*, pp. 389-395, by Messrs. Elihu Thomson, Geo. E. Geyer, Edw. L. Nichols, E. W. Rice, Jr., and W. H. Wahl.

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**ON POLYPHASAL GENERATORS**

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*Discussion*, pp. 586-600, by Messrs. Elihu Thomson, Charles P. Steinmetz, M. I. Pupin, C. S. Bradley and A. E. Kennelly.

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**THEORY OF THE SYNCHRONOUS MOTOR**

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**SOME FEATURES OF ALTERNATING CURRENT SYSTEMS**

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No discussion.

**SOME OBSERVATIONS ON A DIRECT-CONNECTED 300-KW. MONOCYCLIC ALTERNATOR**

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Dugald C. Jackson

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**C. INDUCTION MACHINES**

**A NEW SYSTEM OF ALTERNATE-CURRENT MOTORS AND TRANSFORMERS**

Nikola Tesla

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*Discussion*, pp. 324-327, by Messrs. W. A. Anthony, Nikola Tesla and Elihu Thomson.

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**SOME FACTS ABOUT POLYPHASE MOTORS**

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**EXPERIMENTS ON TWO-PHASE MOTORS**

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**THEORY OF TWO AND THREE PHASE MOTORS**

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*Discussion*, pp. 748-762, by Messrs. M. I. Pupin, C. P. Steinmetz, W. M. Stine and H. J. Sage.

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**THE ALTERNATING CURRENT INDUCTION MOTOR**

C. P. Steinmetz

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**SINGLE PHASE INDUCTION MOTOR**

Charles P. Steinmetz

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Analytical study of the performance of single-phase induction motor and the principles of design. Effect of different types of starting devices upon the performance. Performance characteristics plotted as curves.

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**SOME TESTS WITH AN INDUCTION GENERATOR**

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Experimental investigation of the performance of an induction generator, characteristics being plotted as curves.

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**ALTERNATING CURRENT ELECTRIC MOTORS**

Louis Duncan

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*Discussion*, pp. 222-225, by Messrs. Townsend Wolcott, C. O. Mailloux, F. B. Crocker, F. J. Patten, Louis Duncan, S. S. Wheeler, R. M. Hunter and ——— Waring.

General discussion of alternating current motors. Description of Patten eddy current repulsion motor. Use of resistance to prevent sparking in commutation.

**ALTERNATING CURRENT MOTORS: THE EVOLUTION OF A NEW TYPE**

F. Jarvis Patten

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Description of a double commutator a. c. motor, with circuit diagrams of the different modifications passed through in the process of its development.

*Discussion*, pp. 397-410, by Messrs. E. Jarvis Patten, C. O. Mailloux, R. S. Dobbie, Lemuel W. Serrell, H. Ward Leonard, Allen D. Garratt, E. P. Clark, E. P. Thompson, Elihu Thomson, N. F. Collins, D. C. Jackson, C. J. Reed, E. T. Birdsall and Ludwig Gutmann.

Further data on the Patten a. c. commutator motor. Brief description of Mordey a. c. commutator machine.

**A PROPOSED SYSTEM OF ALTERNATING-DIRECT-CURRENT TRANSFORMATION**

F. Jarvis Patten

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Description of various arrangements of the Patten motor in combination with a Shuckert converter so as to transform single-phase energy to polyphase energy or to direct current.

*Discussion*, pp. 80-94, by Messrs. F. B. Crocker, Carl Hering, F. Jarvis

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E. CONVERTERS

EXISTING COMMERCIAL APPLICATIONS OF ELECTRICAL POWER FROM  
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W. L. R. Emmet

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*Discussion*, pp. 469-480, by Messrs. F. B. Crocker, R. B. Owens, W. E. Goldsborough, Gano S. Dunn and C. P. Steinmetz.

Method of representing armature currents in a synchronous converter. Calculation of voltage ratio of synchronous converters and determination of the armature heating.

F. RESISTORS

A NEW RHEOSTAT

Charles E. Carpenter

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*Discussion*, pp. 506-507, by Messrs. Frank J. Sprague, E. A. Sperry, C. E. Carpenter and F. R. Upton.