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and
ABSTRACTS
on
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Prepared by

ASTM Committee B-4 on Electrical-Heating, Resistance, and Related Alloys

Reg. U.S. Pat. Off.

Special Technical Publication No. 56-G

Published by the
AMERICAN SOCIETY FOR TESTING MATERIALS
1916 Race St., Philadelphia 3, Pa.

Printed in Easton, Pa., U. S. A.

November, 1952

A BIBLIOGRAPHY ON ELECTRICAL CONTACTS 1835 TO 1951

PREFACE

This bibliography is the result of work undertaken by Committee B-4 on Electrical Heating, Resistance, and Related Alloys, of the American Society for Testing Materials, to develop standard methods of testing electrical contact materials and to determine the effect of variables upon performance. It includes articles on contact materials and methods of testing and on the interruption of electrical circuits, covering the period from 1835 up through most of 1951. There are over 1500 references, hundreds of abstracts, and many special articles.

Since the first edition was published in 1944, a supplement has been issued each year, giving the new references and abstracts for the current year. Now, these have all been included in one volume, bringing the compilation up to date with much new material in addition to that for the latest year. Although the project was undertaken originally to give the committee the benefit of the work that has been done by others, the response has been very gratifying ever since it was made available to the public.

Although electrical contacts are a vital part of much electrical equipment, there never has been a standard test procedure for evaluating different materials and types of contacts. The usual procedure has been to test the contacts in the apparatus in which they are to be used. This has the disadvantage that the test data obtained apply only to the particular set of conditions under which the test was made, whereas it is very desirable that the information obtained be of more general application and that comparisons of different materials and different methods of operation may be made.

Appreciating this fact, Committee B-4 made a survey of a large number of producers and users of contacts, to determine whether it was considered desirable and practicable to develop a standard test procedure, by which comparative data could be obtained on the performance of different materials when used as contacts. The response was favorable, so Subcommittee X on Contact Materials, composed of representative men of the industry, both producers and consumers, was organized to undertake this program.

The work of this committee has been directed from its inception by Dr. Fred E. Carter, who has kept the organization going and has kept the discussion in line with the problems by his apt direction of the meetings.

Dr. C. K. Strobel has been secretary of the committee for the past several years and has done an admirable job in maintaining accurate records of the details of all of the regular committee meetings.

As contacts are very widely used, it was decided to limit the work at first to contacts suitable for currents from 0.1 to 50 amps. As a preliminary to its work, the subcommittee made a study of the conditions under which such contacts operate in service and also of the available literature on the subject, including information on the testing of contacts. After two years of development work, a

testing machine was constructed so as to permit certain conditions of service to be reproduced. Then the ASTM Method for Life Test of Electrical Contact Materials (B 182 - 49) was prepared, the latest edition of which is issued by the Society.[1] Eleven machines have been built.

A considerable amount of work has been done on these machines in an effort to standardize tests. It was found very early that standardization of the machines was possible for contact resistance, contact wear, and contact temperatures. Certain conditions could be defined, and these quantities could be determined by various laboratories with results which were in very good agreement.

More difficulty was found in attempting to evaluate the welding or sticking characteristics of contact materials. However, after a considerable amount of work and some revisions of the machine, data were secured from several companies in which the welding characteristics of contacts were evaluated in a reasonable manner. These results were reported in a paper.[2]

The next project undertaken by the group working with these machines was that of investigating the surety of making a circuit on various contact materials. This problem involved the preparation of sample contacts under various oxidizing and sulfiding conditions and accurately testing the results. This problem is not entirely worked out, but sufficient progress has been made that a set of procedures is expected in the not too distant future for evaluating this property of contact materials.

The work on this contact testing machine, from its inception until very recently, was headed by B. W. Jones. On his retirement, his work has been taken over by Dr. J. D. Kleis.

Other activities of the committee included working on the physical properties of contact metals, now headed by F. R. Farnham, a section on standardization of contact forms and sizes, under L. W. Buell, and a section of microcurrent contacts, at present under A. L. Van Emden.

The preparation of the bibliography and abstracts has been made by a committee consisting of

E. I. Shobert, II, Stackpole Carbon Co., *Chairman*
George Durst, General Plate Division of Metals and Controls, Inc.
C. K. Strobel, Robertshaw-Fulton Controls Co.
D. A. Williams, P. R. Mallory & Co.

The abstracts were taken largely from *Science Abstracts* and *Chemical Abstracts*, but in many cases it was necessary to prepare them specially. These were prepared by the following persons:

F. E. Carter, Baker and Co.
P. H. Dike, Leeds & Northrup Co.
S. G. Eskin, Robertshaw-Fulton Controls Co.
J. R. Fritze, Edison G. E. Appliance Co.
H. C. Graves, Jr., Gibson Electric Co.
F. R. Hensel, P. R. Mallory & Co.
S. Keilien, Pass & Seymour, Inc.
J. D. Kleis, Fansteel Metallurgical Co.
E. I. Shobert, II, Stackpole Carbon Co.

[1] 1949 Book of ASTM Standards, Part 2, p. 719.
[2] Erle I. Shobert, II, "Calculation of Electrical Contacts Under Ideal Conditions," *Proceedings*, Am. Soc. Testing Mats., Vol. 46, p. 1126 (1946).

Acknowledgment is gladly made for permission to use abstracts from the following publications:

Science Abstracts
Chemical Abstracts
General Electric Review
A.I.E.E. Transactions and *Journal*
Journal of the Franklin Institute
Journal of the Institute of Metals, London
Battelle Library Review
Engineering Index
Mining and Metallurgy
Chemical and Metallurgical Engineering
Engineer, London
American Welding Society Journal
The Electrician, London

The Technology Library of the Carnegie Library of Pittsburgh has been particularly cooperative in helping us to secure many of the less known periodicals. Their cooperation and interest in our work has been greatly appreciated.

March 7, 1952

DEAN HARVEY
Honorary Chairman, Committee B-4

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