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THE RESEARCH ORGANIZATION OF THE AMERICAN ELECTROPLATERS' SOCIETY

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THE RESEARCH ORGANIZATION OF THE AMERICAN ELECTROPLATERS' SOCIETY

DR. WICK, WHO IS THE CHAIRMAN OF THE RESEARCH COMMITTEE OF THE AMERICAN ELECTROPLATERS' SOCIETY, PREPARED THIS PAPER AT THE REQUEST OF THE EXECUTIVE BOARD OF THE SOCIETY, FOR PRESENTATION AT THE RECENT INTERNATIONAL ELECTRODEPOSITION CONFERENCE HELD IN LONDON, ENGLAND, UNDER THE SPONSORSHIP OF THE ELECTRODEPOSITORS' TECHNICAL SOCIETY.

The rate of future development of the field of electrodeposition depends on the continuous growth of pertinent fundamental and technical knowledge. The American Electroplaters' Society has recognized the necessity for sustained research effort to safeguard the future of electrodeposition. The scope of industrial and institutional research is governed in many instances by local circumstances, and in consequence seldom achieves either breadth or depth. As a rule, such research is directed to the solution of a specific problem and results in a commercial process of economic value. These factors pertain to the question of the definition of the scope and aims of a Research Program to be sponsored by a Technical Society.

The research activities of the American Electroplaters' Society were interrupted during the war period and were resumed late in 1944. In renewing the Society's Research Program after this lapse, careful attention was paid to the nature of future research work, the placement of research projects, and the organization for research that would be most effective. An adequate program for guaranteeing financial support is a fundamental requirement for a sustained research effort.

The Research Committee

The American Electroplaters' Society, through its Executive Board, placed the responsibility for the organization and administration of the Society's Research Program in the hands of a Research Committee composed of nine appointed members, with the President of the Society and its Executive Secretary as members ex-officio. Each appointee serves for a term of three years, three new members being appointed annually. The committee members elect the Chairman of the Research Committee. Quarterly meetings of the Research Committee are held, at which questions of policy are developed. The Committee approves each new research project prior to its installation in the program. There are four principal sub-committees charged with the administration of the Research Program under the authority of the Research Committee. These sub-committees are for Policy, Publicity, Finance, and Research Direction.

Sub-Committee on Policy. The Chairman of the Research Committee with the Chairmen of the Committees on Publicity, Finance, and Research Direction, comprise the Policy Committee. This committee administratively interprets the policy of the Research Committee in regard to the problems at hand and recommends for the approval of the Research Committee any necessary policy changes.

Sub-Committee on Publicity. The dissemination of information concerning the Society's Research Program, other than the technical publications, is the responsibility of the Publicity Committee. Due to the size of the research activity, it became manifestly necessary that all matters of publicity be cleared through a central committee in order that a consistent policy might be maintained. The Publicity Committee receives material pertaining to the research projects in progress from the Chairman of the Research Directing Committee. This specific information on the research projects is correlated with other pertinent matter for presentation in a suitably comprehensive and organized form.

The Finance Sub-Committee. Working closely with the active Branches of the American Electroplaters' Society, the Sub-Committee on Finance is engaged continuously in maintaining and increasing the list of Sustaining Members that comprise the industrial support for the Research Program. Through their Branches, many of the individual members of the Society contribute directly to the Research Fund. Sustaining Membership is awarded to industrial concerns and others contributing more than a minimum amount annually toward the Research Program. The current number of Sustaining Members approaches 300 and is growing rapidly. It is this financial support of industry that makes the extensive program possible.

The Research Directing Sub-Committee. The administration of the Research Program is the responsibility of the Research Directing Sub-Committee. The Research Committee operates exclusively through its Research Directing Committee in regard to the individual projects. The responsibility of this committee for administration is complete. It starts with the installation of the project at the university or other research center selected. The organization of the program, the appointment of the project sub-committee, the general guidance of the project throughout, and finally the determination of the correct time to terminate a given research in view of its original objectives, are part of the duties of this Sub-Committee.

The Research Program

The resumption of research prior to the end of the war afforded the opportunity to initiate a modern program, both comprehensive and basic, for investigations designed to increase the fundamental and technical knowledge necessary for substantial future advances in the science and technology of electrodeposition. Topics selected as subjects for research are component parts of a broad program. Definite interrelation exists between groups of research projects according to deliberate plan recognized in the co-administration of the active program. As an example, the projects on the analysis of impurities, the effect of impurities and purification are coordinate, and both complement the projects on porosity and on physical properties of electrodeposits.

It is held by the Research Committee that its researches should not duplicate work in progress by others. It is a matter of policy that the researches should tend to expand knowledge on technical and fundamental matters rather than duplicate the objectives of industrial research laboratories in regard to the development of operating processes. The Research Program is designed for long range operation, and the firm policy to avoid researches on commercial processes is an important keystone in the permanent structure of the work. It is to be expected that increased progress in the development of commercial processes by the industry in general will be one result of the successful execution of our basic program.

In furtherance of the broad objective of these researches, every assistance and encouragement possible is rendered others interested in researches in the field of electrodeposition. The preexistence of research activity in a given university is not a prerequisite for active participation in this program. It is considered beneficial to the field of electrodeposition to stimulate the interest of professors competent in research, so that in some instances the Society's research project becomes the first project within the university in the field of electrodeposition.

Active Research Organization

After correct selection of research projects and adequate financing, the continuing success of the Research Program is determined by the calibre of organization, correlation, and supervision afforded by the Research Directing Committee. The Chairman of the Research Directing Committee is the central authority for administration. He is assisted by Vice-Chairmen each supervising a group of projects. Reporting through the Vice-Chairmen are Project Committees, each comprising three men selected from indus try, who can confer with and advise the Project Director on all technical matters pertaining to his research. The Project Director is generally a professor of our own selection who is directly responsible for the research results. He is assisted by a graduate student, usually through a fellowship established at the university. Alternatively, the project may be at a research institution such as the National Bureau of Standards or an industrial research laboratory, depending upon the location of the Project Director.

It was an original conception of this program to combine the academic viewpoint of the university, through the professor selected, with the industrial viewpoint, by the appointment of the most competent men avilable from industry to form the three-man Project Committee. Experience during three years has more than justified this policy. The total force applied to each research comprises at least seven men: the Research Fellow, the Project Director, the three industrial specialists comprising the Project Committee, and the Vice-Chairman and the Chairman of the Research Directing Committee. Fine relationships have developed between the Project Directors and the industrial specialists, all focusing their attention on the same projects. Unsolicited testimony from both groups shows that the combination of talent is both beneficial and welcome.

In most research projects the initial step is the development of a bibliography followed by a correlated abstract and critical review of the published literature. In only a few cases has this appeared undesirable, and in those cases the determination has been to publish the state-of-the-art material at the end rather than at the beginning of the project. The permanent value of such critical literature reviews was never doubted, but the evident value of such work has become enhanced, for example, through the uncovering of more than 2,400 references on the subject of "Impurities and Purification of Electroplating Solutions". It is the purpose of this part of the work to secure as complete literature coverage as possible in order to facilitate all future researches along similar lines.

The specific experimental program is developed during the initial period devoted to the literature study. The most recent organizational modification is the institution of a temporary "Project Organizing Committee", the purpose of which is the development of the specific program prior to the active installation of the project.

Publication of the results of the Research Program is made usually in THE MONTHLY REVIEW* of the American Electroplaters' Society. Annually a report is made to the Society, at its Convention, on elements of each project. These reports appear in the *Proceedings* of the American Electroplaters' Society. Individual papers, or short series of papers, on a given project are bound in booklet form as Research Reports and made available at slight cost. A library of these Research Reports will one day constitute an important source of technical information in our field. This system of Research Reports is not unlike that employed by the International Tin Research and Development Council.

List of Researches

The first three of the list of active researches reflect the war conditions prevailing at the time the present research activity of the American Electroplaters' Society began. The projects on "Stripping of Copper", "Determination of Impurities", and "Adhesion" are recognizable as subjects that were of particular interest then. In the accompanying list there is given the serial number and the title of each research, the Project Director's name and affiliation, and the date on which the project was accepted by the Research Committee as part of the program. This information is shown in the Table.

The first project was instituted under the direction of Professor F. C. Mathers at Indiana University on "Stripping of Copper from Various Base Metals". This project, begun in 1944, is not now active. It had as its objective immediate practical results that were obtained and found to be useful.

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*Beginning January, 1948 THE MONTHLY REVIEW will be called PLATING.

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Project No. Title	Location	Project Director and Assistant	Project Directing Sub-Committee	Year Project Accepted
1. "*Stripping of Copper from Various Base Metals*"	Indiana University	Prof. F. C. Mathers Mr. E. L. Martin (Assistant)	Mr. L. E. Weeg, Chairman, C. G. Conn, Ltd. Mr. L. C. Borchert, Houdaille-Hershey Corp. Dr. H. J. Wiesner, C. G. Conn, Ltd.	1944
2. "*Determination of Impurities in Electroplating Solutions*"	Lehigh University	Prof. E. J. Serfass Mr. W. S. Levine (Assistant) Mr. P. J. Prang, Jr. (Assistant)	Dr. D. G. Foulke, Chairman; Hanson-Van Winkle-Munning Co. Dr. W. R. Meyer, The Enthone Co. Dr. Henry B. Linford, Columbia University	1944
3. "*Methods for Testing Adhesion*"	University of Michigan	Prof. A. L. Ferguson Mr. M. R. Makepeace (Assistant) Mr. M. U. Tsao (Assistant)	Dr. R. B. Saltonstall, Chairman; Udylite Corp. Mr. F. C. Mesle, Oneida, Ltd. Mr. E. Hahn, Ainsworth Manufacturing Co.	1944
4. "*Effect of Surface Finishing of Non-Ferrous Base Metals on Protective Value of Plated Coatings*"	U. S. Time Corp., Middlebury, Conn.	Dr. George J. Kahan Mr. John W. Rigney (Assistant) Mr. J. O. Fairbanks (Assistant) Mr. Joyce Mulcrone, (Assistant)	Mr. M. B. Diggin, Chairman; Hanson-Van Winkle-Munning Co. Mr. E. A. Anderson, New Jerzey Zinc Co. Mr. A. W. Tracy, The American Brass Co.	1947

Project No. Title	Location	Project Director and Assistant	Project Directing Sub-Committee	Year Project Accepted
5. "*Effects of Impurities and Purification of Electroplating Solutions*"	Michigan State College	Prof. D. T. Ewing Mr. W. D. Gordon (Assistant)	Mr. B. C. Case, Chairman; Hanson-Van Winkle-Munning Co. Mr. L. B. Sperry, Doehler-Jarvis Co. Mr. R. C. Olsen, General Motors Corp.	1945
6. "*The Nature and Effect of Porosity in Electrodeposits*"	Princeton University	Dr. N. Thon Mr. E. T. Addison (Assistant)	Dr. W. A. Wesley, Chairman; International Nickel Co. Dr. B. Egeberg, International Silver Co. Mr. A. Mendizza, Bell Telephone Lab., Inc.	1946
7. "*Methods for Testing Thickness of Electrodeposits*"	Pennsylvania State College	Prof. H. J. Read Mr. J. H. Thompson (Assistant)	Mr. J. Mazia, Chairman; American Chemical Paint Co. Mr. G. Bowman, Standard Steel Spring Co. Mr. A. H. DuRose, Harshaw Chemical Co.	1946
8. "*Polarization at Electrodes in Electroplating Processes*"	University of Michigan	Prof. A. L. Ferguson Mr. R. S. Karpiuk (Assistant)	Dr. R. A. Schaefer, Chairman; Cleveland Graphite Bronze Co. Mr. E. Hahn, Ainsworth Manufacturing Co. Mr. G. Dubpernell, United Chromium, Inc.	1946
9. "*Physical Properties of Electrodeposited Metals*"	National Bureau of Standards	Dr. A. Brenner Mr. C. W. Jennings (Research Associate)	Dr. W. Blum, Chairman; National Bureau of Standards Mr. C. H. Sample, International Nickel Co. Mr. N. Promisel, Bureau of Aeronautics, Navy Department	1947
10. "*The Disposal of Plating Room Wastes*"	Yale University	Prof. B. F. Dodge Mr. D. C. Reams (Assistant)	Dr. C. F. Gurnham, Chairman; Whitney-Blake Co. Mr. M. L. Ross, E. I. du Pont de Nemours & Co. Mr. M. A. Orr, International Silver Co.	1947
11. *Current and Metal Distribution in Electroplating*"	Negotiating	....	....	......
12. "*Cleaning and Preparation of Metals for Plating*"	Negotiating	....	....	......
13. "*Internal Stress in Electrodeposits*"	Negotiating	....	....	

"The Determination of Impurities in Electroplating Solutions" is the second project. It was placed originally under the direction of Professor G. Frederick Smith at the University of Illinois, with Professor Frederick Duke as the Research Fellow. Less than a year later, in 1945, the project was assigned to Professor E. J. Serfass at Lehigh University, where it is active today. Numerous individual papers on specific methods of analysis of impurities in nickel plating solutions have been published from this project These methods are available in bound form as Research Reports. The work is continuing on the study of impurities in copper plating solutions and will cover ultimately all commercial plating solutions.

The third project of the original group began in 1944 and was entitled: "Methods for Testing Adhesion". Professor A. L. Ferguson at the University of Michigan was appointed Project Director. The survey of the literature on "Adhesion of Electrodeposited Metals" is particularly complete. In addition, valuable information was brought to light through the publication of two papers covering the private file data that had been furnished to Professor Ferguson during the course of his investigation.

Project No. 4 is a continuation of previous work on ferrous metals by Dr. William Blum at the National Bureau of Standards. This project is entitled: "The Effect of Surface Finishing of Non-Ferrous Base Metals on the Protective Value of Plated Coatings". It has been placed at the Research Laboratory of the U. S. Time Corporation at Middlebury, Conn.; the Project Director is Dr. George J. Kahan. Among the least known of the several factors influencing the protective value of plated coatings is the quantitative effect of surface finishing, especially of non-ferrous metals. It is the objective of this project to determine whether surface finishing, particularly within commercial limits, can effect a significant influence on the protective value afforded by the plated coating.

The project on "Effects of Impurities and Purification of Electroplated Solutions" is the fifth project in the research program. It was begun in 1945 under the direction of Professor D. T. Ewing at the Michigan State College. Close cooperation exists between Project No. 2 on the analysis for impurities, and this project. The literature on this subject can be found to be so extensive as to render it substantially unavailable. The correlation of this literature, which is being done stepwise in reference to individual plating solutions as a matter of convenience, represents a valuable contribution. Experimental work now in progress is bringing to light new data of permanent value.

In 1946, a fundamental research on "The Nature and Effect of Porosity in Electrodeposits" was instituted at Princeton University. Dr. N. Thon is the Project Director, working in the laboratory of Professor Hugh S. Taylor, with whom he is associated. The critical literature review just published by Dr. Thon as part of this program is an outstanding contribution to this subject in which so little real progress has been made. Results of fundamental importance are a reasonable expectation from the continuance of this Research Project.

A matter of prime importance to all electrodepositors is the determination of the thickness of coatings. Accordingly, the seventh research project, entitled "Methods for Testing Thickness of Electrodeposits", was instituted in 1946 at the Pennsylvania State College. Professor Harold J. Read is the Project Director. The critical review of the plenteous literature is nearly completed. It is the objective of this research to develop comparative data on the precision and accuracy of the applicable methods for determining thickness of all commercial electrodeposits on the several base metals to which they are normally applied.

Professor A. L. Ferguson at the University of Michigan has undertaken his second projectfor us as Project Director of our eighth research on "Polarization at Electrodes in Electroplating Processes". Circumstances beyond our control will require a temporary deferment of this project, but not before preparation of the literature survey and review can be completed.

Dr. William Blum at the National Bureau of Standards is a member of the Research Committee. Through his arrangement we are fortunate in having his associate Dr. Abner Brenner with us as Project Director for Project No. 9 on "Physical Properties of Electrodeposited Metals". This project is uniquely located at the National Bureau of Standards in Washington, D. C., where there are unsurpassed facilities for the specialized scientific techniques required in research of this character. This project, which began in 1947, is now well under way and is developing basic technical data that are much needed.

A chemical engineering problem that is increasingly important is the subject of our tenth project on "The Disposal of Plating Room Wastes". Professor B. F. Dodge, head of the Department of Chemical Engineering at Yale University, is Project Director. The problem of plating room waste disposal is not simple, including as it does chromic acids and cyanides as well as mineral acids and alkalies. A further complication is that methods eminently suitable for large installations are unsuitable for the small shop. Accordingly, it is an objective of this research to develop methods for small scale operations as well as for the larger users of electrodeposition.

Three remaining projects complete the current list at this writing: "Current and Metal Distribution in Electroplating", "Cleaning and Preparation of Metals for Plating", and "Internal Stress in Electrodeposits". Those three projects represent the immediate extension of the Research Program and are to be installed upon completion of their technical organization and the selection of the Project Director and university center.

Recognizing that the research organization described above and outlined in Table I is actively in progress, it is evident that a new opportunity has been afforded interested industry to cooperate both technically and financially in support of the program. This support has been realized in very practical terms. Not only has industry given generous financial support, but it has welcomed the opportunity for its technical staffs to participate actively in the program through work on the committees. The broad benefits of participation in this program are becoming still more apparent as the researches gather momentum.

Close interrelation and cooperation is maintained with coordinate societies. The American Society for Testing Materials is closely connected with our research work through the joint membership of several individuals on both groups. In extension of previous close relations, the A. S. T. M. is the issuing source for specifications that may develop from the American Electroplaters' Society Research Program. Similarly, the Electrochemical Society, the American Zinc Institute, the American Iron and Steel Institute, etc., have cooperated in one or another degree in connection with the program or its elements. The coordinate relation between the Research Program and the activities of other Societies is increasing steadily.

The purely technical and scientific basis of the Research Program has served to eliminate personal considerations to a marked degree, and has resulted in an exceptionally altruistic attitude on the part of each individual associated in this work. This desirable situation is made possible partly by the careful avoidance of conflict with industrial research interests. The criterion for all decisions in regard to the administration of these researches has been the best good for the field of electrodeposition. The satisfaction of accomplishment and interest in the work is the only compensation afforded the committee members.

The development and organization of the Society's present Research Program has been organic. Although it developed rapidly, it did not spring forth fully grown. Many problems were encountered in establishing the researches which, aside from the program subjects, included the selection of Project Directors, contractual relations with universities, selection of Project Committee personnel from the standpoint of capacity, interests and geographical location, and the initiation of the desired *modus operandi*. The interrelationship between projects, fostered by exchange of current information, and the development of private file data from industrial concerns and private sources, made possible by the Society's sponsorship, are all aspects of the program in motion. Continuation of this research for a period of ten years, augmented by the work of other interested groups, gives promise of a decade of fundamental progress heretofore unequaled.

50th ANNUAL
EDUCATIONAL SESSION
and BANQUET

American Electroplaters' Society

Newark Branch

DECEMBER 13th and 14th, 1963

IN THE GRAND BALLROOM OF THE

ROBERT TREAT HOTEL NEWARK, N. J.

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of the

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and

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Educational Session..8:30 P.M.

Friday, December 13, 1963

JOHN TRUMBOUR, *Presiding*

"Silicates and Cleaners"

Mr. Gregory Martusevich

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Banquet ....8:00 P.M.

Saturday, December 14, 1963

MENU

Fresh Orange - Grapefruit Supreme

Cream of Mushroom Soup

Hearts of Celery *Queen Olives*

Roast Prime Ribs of Beef, Au Jus

Rissole Potato *French String Beans*

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New York Branch

Annual Open Meeting and Banquet

FEBRUARY 14, 1953

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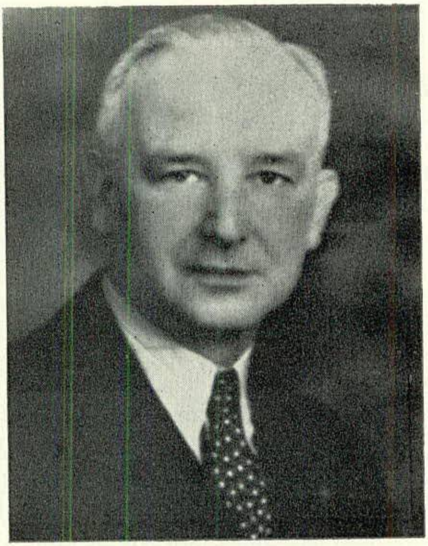
NEW YORK CITY

In Dedication



HORACE H. SMITH

It is with humility that the New York Branch dedicates this issue of its Annual Journal to Horace E. Smith of the Newark Branch, who passed away soon after attending our last Annual Banquet.

For a long time Horace had been as much at home here in New York with us as he was in his own branch. It was greatly through his help that the Society progressed to its present position as one of the leading technical societies of the country.

We shall long remember the conventions at Asbury Park and Atlantic City, in which Horace was so active, and shall miss him at the Newark annual meetings. We, in the New York Branch, feel that we have lost one of our "old-time" friends.

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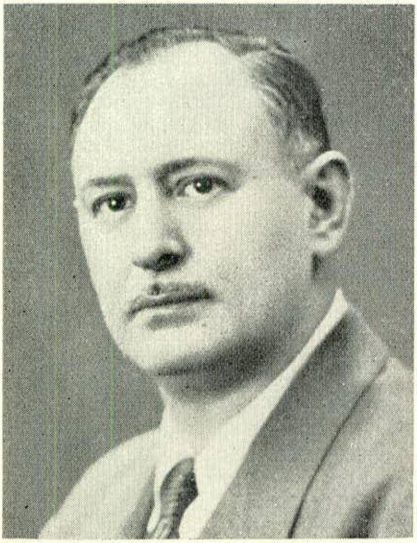

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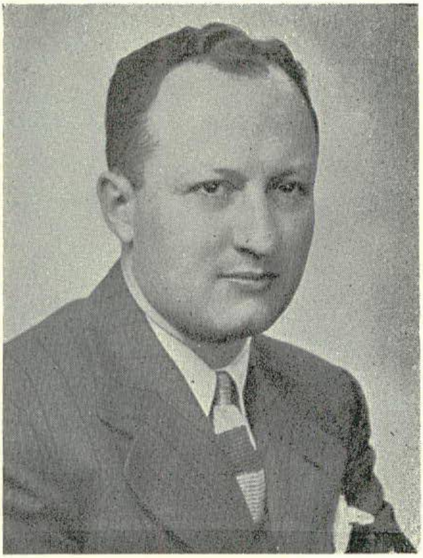

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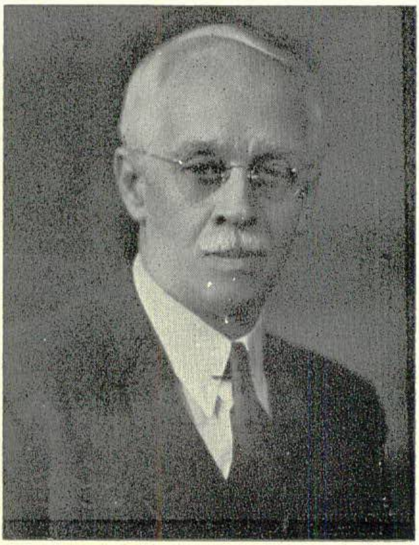

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2:30 P.M.

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"ECONOMIC ADVANTAGES OF PREPLATED WIRE"

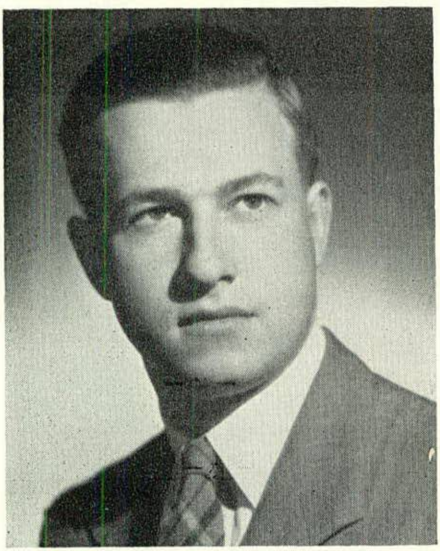
by Mr. Peter Stevens, Chemist, Kenmore Metal Prod. Corp., N. J.

"WHAT IS QUALITY?"

by Mr. C. F. Nixon, General Motors Research Dept.

"WHAT OF TOMORROW"

by Dr. Louis Weisberg, Chemical Engineer



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Celery — Olives

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Bombe Tutti Frutti

Strawberry Sauce — Petits Fours

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DIE CASTING

By PETER L. VEIT

In keeping with today's mass-production practices, the field of die casting has taken on a continually more important place in the metal fabrication field. However, before becoming marketable items all of these castings require various forms of finishing. Such finishes may include anything from rough grinding to high polishing and gold or rhodium plating. This paper is intended to give the metal finisher a birds-eye view of some of the considerations which go into the designing and making of die castings so that he may have a better understanding not only of his own problems but also those of the die casting firms.

Die casting is a form of mechanized permanent-mold casting, where the molten metal is injected into the mold under pressure. By employing this direct pressure, the fluid metal may be forced into very intricate patterns with great precision. Due to almost total mechanization, tremendously large production rates are obtained as compared to other forms of permanent or sand mold casting.

Die castings are principally made of special alloys of zinc, aluminum, magnesium, and the brasses in that order of frequency. To a small extent, alloys of tin and lead are also cast by these methods. In size, die castings may range from a fraction of an inch to complete automobile door frames measuring 43 by 30 inches. The size is only limited by the size of the dies available, whereas the uses to which the castings may be put is only limited by the properties of the metals employed.

Part I. Advantages and Disadvantages of Die Casting

Advantages of Die Casting Techniques:

The principal advantages which die casting presents over other metal forming processes are: large variety of permissable designs, high production rates, elimination of machining costs, low general labor cost, and a readily finishable product.

Each die casting is an exact duplicate of all other castings made from the same die, which means that all parts cast from the same mold are interchangeable with all other parts. This in turn permits the casting of very intricate assemblies in two or three parts and then assembling them into one unit with a minimum of machining.

By the use of cores very precise slots, holes and recesses are cast, thereby eliminating the need for a large percentage of drilling and milling. (Cores as small as 1/32 of an inch have been employed with zinc die castings.) In very complex dies, threads have even been cast into the metal by using a core which rotates as the die is opened thereby unscrewing it.

Due to the direct pressure on the fluid metal and the smooth die faces, thinner sections may be made by die casting techniques than by any other metal casting method. This results in lighter weight parts and the production of units which previously called for assembled sheet metal stampings.

Weaker sections may be reinforced with ribs or bosses without materially increasing the over-all size or weight of the casting. This is frequently important on the thin sections referred to in the preceding paragraph.

Inserts of other metals (and occasionally even non-metallic materials) may be cast directly into the work saving costly assembling operations.

Outside threads, gear teeth, cam contours and various other high precision

areas may be cast so that nothing aside from the removal of parting lines, runners, and flash need be done before final assembly or finishing.

Production rates as high as seven hundred die fillings per hour on small parts are claimed by some manufacturers of die casting equipment. In addition to this, multiple-cavity dies may produce as many as thirty to forty small units at each filling. This in turn makes possible a total production rate of twenty to thirty thousand parts per hour per machine. (The seven hundred shots per hour mentioned above is an extreme limit, but rates of from four to five hundred shots per hour are not uncommon.)

The dies employed in these techniques are useful for relatively long periods of operation. Those dies used on zinc generally are good for one million die fillings. Aluminum dies are good for approximately two hundred and fifty thousand shots while those used on brass have a somewhat shorter life, from ten to seventy-five thousand fillings. Frequently it is possible to repolish a die after these periods and make them usable for an additional period.

The individual casting may be made fairly intricate so as to hold the extra handling and machining to a minimum thereby increasing the production rate in the remainder of the plant aside from the die casting department.

Since only from one to three men are generally required to operate a die casting machine, the labor cost is very low per casting produced.

Die casting techniques are very economical with respect to metal usage. All defective parts as well as the gates, runners, and flash may be remelted and re-used. Unlike other casting techniques, this metal is not contaminated with the mold material. Slight alloy adjustments must be made in order to replace any constituents that have been lost. However, it is simple to control this by regular analytical procedures.

For utility parts such as pump housings, carburetors, pipe connections and internal parts, frequently no surface finishing or machining is required. The use of gaskets and oils provide all the necessary protection and the use of self-tapping screws in the cored holes serve to assemble the units.

Due to smooth die faces very little polishing or grinding is called for even in the production of high quality finishes. Generally barrel finishing techniques or buffing with cloth wheels or abrasive belts serve to accomplish the necessary surface finishing.

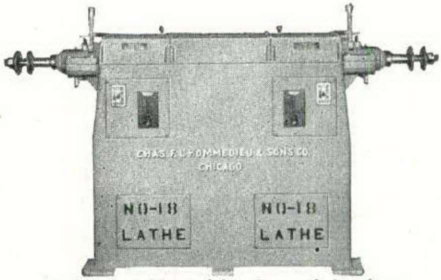
Organic and metallic finishes are readily applied to most die cast parts. This is frequently done directly by several of the larger die casting firms. On all but the aluminum die castings, it is necessary that some finish of this type be applied to protect a high quality surface.

Disadvantages of Die Casting Techniques:

Most of the principal disadvantages which die casting presents are concerned with the high initial cost of setting up the operation.

The die casting machine is a very intricate unit composed of a bed on which the dies are mounted, hydraulic pressure equipment both to hold the die shut during pouring and to force the metal into the die, a furnace to melt the metal and hold it in the molten stage. (The machines will be further described later in this paper.)

Few companies get their own die casting machines, but rather have a reputable casting plant do the casting for them. For the manufacturer considering employing die castings, the cost of the die is the greatest single cost factor. The dies are very intricate mechanisms consisting of not only the die cavity but also cores and knock-out pins for ejecting the completed casting from the mold. The largest casting produced by one die caster, for example, is the car door previously mentioned. The die to cast this unit weighs 13½ tons and has



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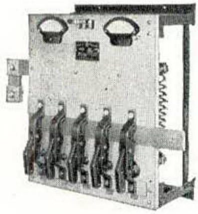

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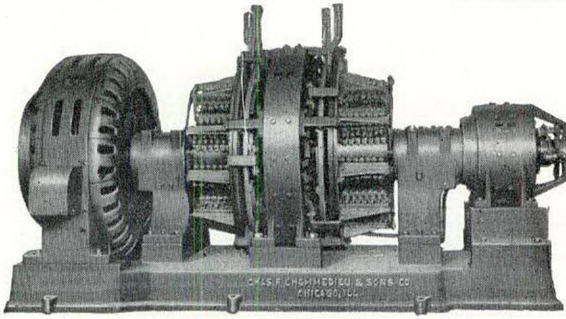

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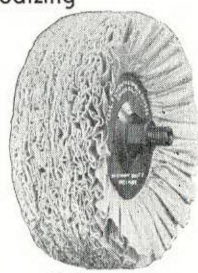

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170 ejector pins and 70 stationary cores. Since all of this must be made by expert tool makers, and properly heat treated, the cost of a die occasionally runs into five figure numbers.

Unlike some of the other casting processes, die casting requires very ridged control over the alloy compositions. Some constituents must be controlled to $1/8\%$ and other foreign matter must be kept to a maximum of .0001. In order to do this, elaborate analytical procedures must be installed. Spectrographic analysis is not uncommon today in some of the larger die casting plants. Although this equipment pays off in better castings and lower percentages of rejects, the initial investment is still a considerable amount.

From the foregoing, it may be concluded that die casting presents the metal fabricator with a rapid method of producing castings of high precision and having very desirable characteristics as to design and necessary subsequent operations. However, unless a sufficient production is planned, the high initial cost is prohibitive. When the quantity of production is sufficiently high, the cost of die casting is far below any other casting method, and at times even approaches punch press operational costs.

Part II. Die Casting Machines

The die casting machine has the basic function of holding together two halfs of a die while the molten metal is forced into it. As soon as the metal has sufficiently solidified, the die must be opened by the machine and the casting ejected. Besides supporting the dies and providing the mechanism for closing, locking, unlocking, opening the die and injecting the molten metal, the machines must also have some type of attached or auxiliary furnace in which the metal may be melted and held at the casting temperature.

The machines normally employ either full hydraulic die clamping or a mechanical toggel type clamp. With full straight-line hydraulic clamping, live pressures up to 500 tons are needed to back up the dies at all times when in the closed position. These high pressures are necessary to hold the dies shut against the pressure employed on the metal. In some cold chamber machines, on very intricate patterns, the pressure on the metal may reach as high as 60,000 psi.

There are two basic types of die casting machines, the **submerged plunger** type for use on low melting point alloys such as zinc, lead and tin and the **cold chamber** type for use principally on aluminum, magnesium, and copper alloys.

Submerged Plunger Machines:

The majority of the die castings today are made in the submerged plunger type of machine using zinc base alloys. This type of unit contains a gas or oil fired furnace with an iron pot for melting and holding the molten metal. In this pot there is a submerged vertical cylinder with a plunger to force the molten metal through a goose-neck and nozzle into the die.

When the plunger is raised, it uncovers a port below the liquid metal surface so that the metal may flow into the cylinder and fill it. The plunger is then pushed down forcing the metal into the die. After a pre-determined interval the plunger is raised so that all the metal in the goose-neck (up to the nozzle) solidifies and is ejected with the casting.

Generally the pressures employed in this type of machine are below 2,000 psi. The injection speeds as well as the pressure may be varied to suit the particular alloy and die used. Since there is no ladling of the metal necessary in this type of machine, they are capable of higher production rates than the cold chamber units.

Cold Chamber Machines:

The cold chamber machines are employed for aluminum, magnesium and

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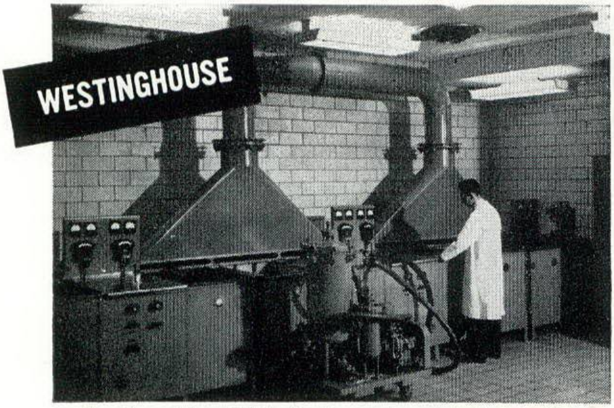

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copper alloys. The excellence of the castings produced is largely due to the very high pressures employed. The cold chamber type of machine differs from the preceding type in that the injection cylinder and plunger are not immersed in the molten metal. The cold chamber is a horizontal cylinder into which the molten metal is ladled (frequently by hand) from a separate holding furnace. After the cylinder has been filled, the plunger advances under high pressure and forces the metal into the die. Any excess metal solidfies at the end of the chamber and is ejected with the casting.

Since the molten metal's contact time with the cold chamber is very brief, the danger of iron pick-up by aluminum is held to a minimum. This is very important, since only a slight trace of iron imparts undesirable characteristics (such as poor corrosion resistance) to the aluminum. Furthermore, the close fit between the plunger and cylinder is preserved for a longer period of time.

The need for ladling the molten metal for each shot, slows the cycle as compared to the submerged plunger type of machine. The casting rate is approximately 100 die filling per hour. This, of course, may be a great deal less for larger castings or castings requiring inserts. Slightly higher production rates may be obtained on small simple castings.

The pressures employed in this type of machine generally range from six to twenty thousand psi but may go as high as sixty thousand psi.

The two types described above are the basic units used in the die casting industry. However, each manufacturer has certain modifications for his particular machines. Methods of applying the pressure, cooling the dies, the location of the holding pot or furnace, the methods of removing the finished castings from the die casting machine, etc. would fall under these modifications. These matters, however, are beyond the scope of this paper and will not be covered.

Part III. Die Casting Metallurgy

The metallurgy of die casting is primarily one of PURITY. Unlike other casting processes where the metal composition is controlled to approximately 1%. In die casting these tolerances approach .005%. This is especially true of not only the metal constituents, but of the metallic impurities.

It is this rigid control of the composition that has resulted in the properties of die castings. Originally die castings were extremely brittle and it was not possible to solder them when damaged. Modern die castings, such as automobile grills, are quite capable of taking mechanical shocks and minor dents without breaking or cracking. This composition control has, furthermore, made possible the casting of very fine and intricate designs and relative freedom from cold-shot marks and other surface defects. Casting rejects are also lower in die casting than in any other casting process.

In order to properly control the alloy composition, each batch of metal received is carefully analyzed and the proper steps taken to either increase or decrease particular constituent. For example: A certain zinc die casting is to contain 0.005 max. of cadmium and 0.017% magnesium but the melt in the pot contains 0.007% cadmium and only 0.014% magnesium. To correct this, this metal must be mixed with another shipment containing less than 0.005% cadmium till the mixture meets the maximum cadmium specification. The magnesium, on the other hand, may be added to the melt in the proper quantity.

When the flash, gates and runners are re-melted they again must be re-analyzed to correct for any material that may have been slagged off. (Magnesium additions are a prime example of this.)

The two principal additions to the base metals are silicon and copper.

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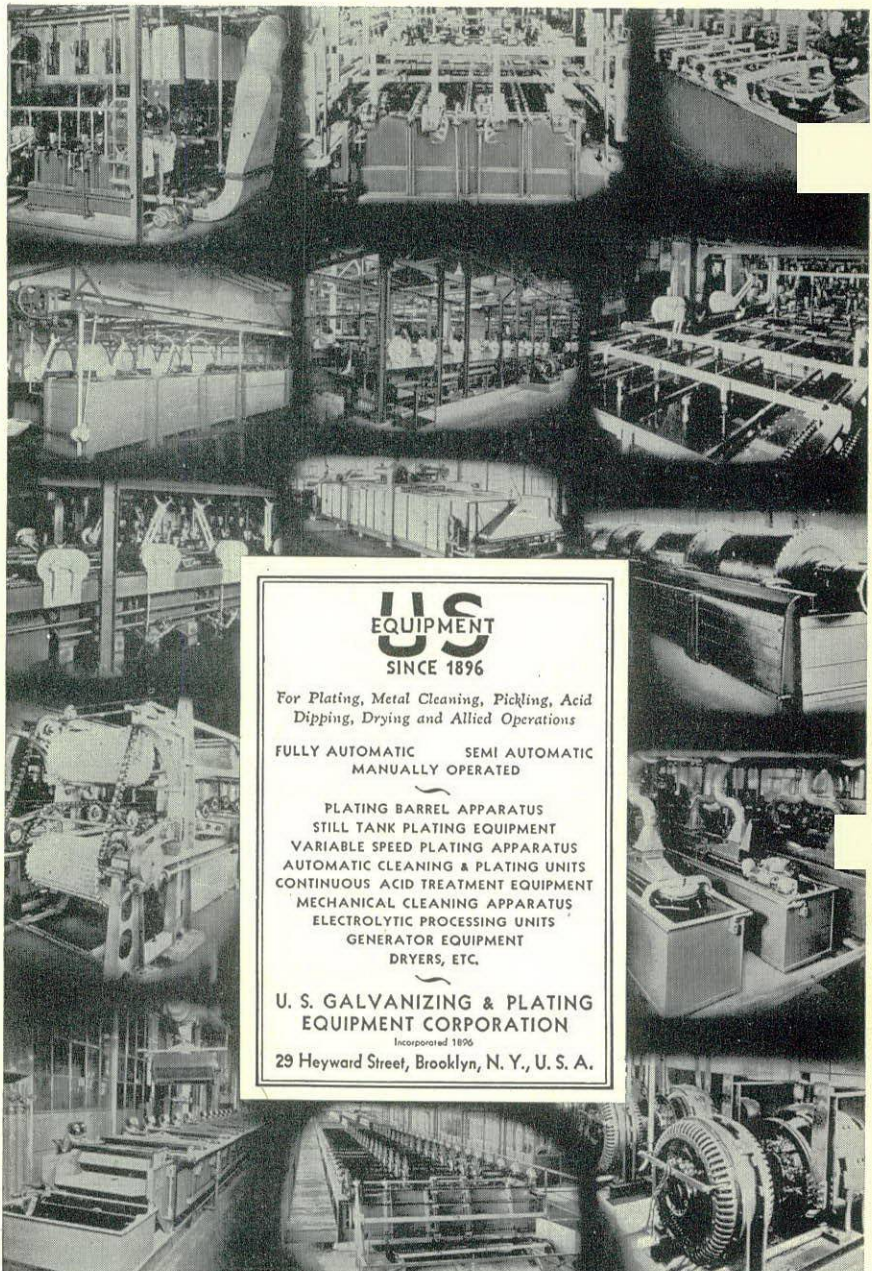
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Aside from these, magnesium, aluminum and zinc are the chief additives, (to metals other than themselves). These additives are generally already in the metal as received from the supplier and only small adjustments need be made.

Silicon is generally added to give the liquid metal greater fluidity. This enables it to better "wet" the mold and thereby produce better and more accurate re-productions. In aluminum castings, silicon also increases the corrosion resistance.

Copper is primarily added as a hardening agent. This produces more rigid castings with higher tensile strengths. Copper also decreases the amount of shrinkage and hot shortness. However, it lowers the corrosion resistance when in excess of 0.25%.

Magnesium is added to the metals in order to increase the machining ability as well as to increase the corrosion resistance. The addition of magnesium decreases the ductility of the castings and must therefore be kept to the minimum necessary to accomplish the purpose intended.

Aluminum is added to zinc die castings as a hardener and to control the shrinkage of the metal on cooling.

At this point a large number of alloys could be listed. However, the reader can find them by looking up their compositions in the **METALS HANDBOOK.** Furthermore, anyone seriously considering employing die casting should carefully plan the design of the casting, the design of the die, and the alloy to be employed in direct cooperation with the die casting firm. These companies, with their many years of experience can frequently save the manufacturer many thousands of dollars by a few simple design modifications.

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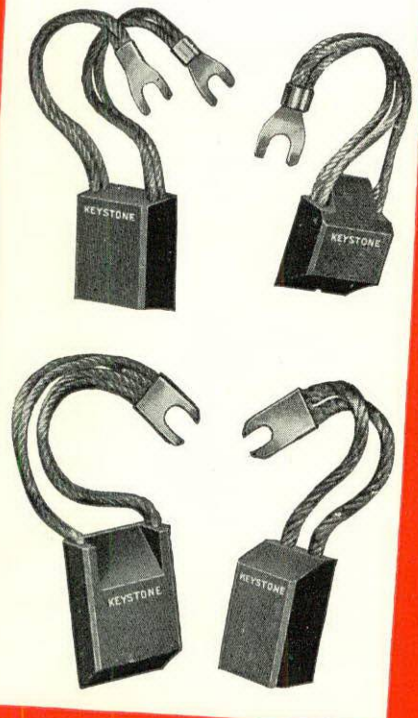

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Name	Address	Business Connection
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J. Robert Wasilewski	97 North 4th Street Brooklyn 11, N. Y.	Foreman Etched Products Corp. 39-01 Queens Blvd., L. I. C., N. Y.
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Michael Yacco	85 Harding Avenue Clifton, N. J.	Hard Chromium Plating Works 501 - 20th Avenue Paterson, N. J.
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American Electro Platers' Society

TENTH ANNUAL
EDUCATIONAL SESSION
and Dinner-Dance

Saturday, April 25, 1953
Antlers Hotel

Educational Session
1:30 P. M. Sharp

Dinner
6:30 P. M.

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Antlers Hotel

1:30 P. M. Sharp *Saturday, April 25, 1953*

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The Annual Educational Session and Dinner-Dance Programs, like a bridge affording passage over rivers or chasms, provides a means of bringing together a variety of endeavors in the field of electroplating to a common plane of interest.

Through research and cooperative effort, obstacles, limitations and specific probems will be overcome, as the competitive American industrial system advances.

Only by discernment to perceive, courage to undertake, and patience to carry on, each in his particular phase of work, can the electroplating industry as a whole continue to progress.

With a "forward look" to the future, you are extended a cordial welcome to this Tenth Annual Educational Session and Dinner-Dance Program.

Grateful appreciation is expressed to the sustaining contributors who make this program possible through their generosity.

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DINNER MENU

Shrimp Cocktail

T-Bone Steak

Baked Potatoes

Lima Beans

Combination Salad

Lime Sherbet

Coffee—Rolls

Individual music by THE "JOAN TRIO"
during dinner.

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Program

TORONTO BRANCH
of the
AMERICAN ELECTROPLATERS SOCIETY

41st ANNIVERSARY

Annual Educational Meeting, Dinner and Dance

HOTEL GENERAL BROCK
(NIAGARA FALLS, ONT.)

SATURDAY AFTERNOON AND EVENING
MAY 2nd, 1953

OUR SPEAKERS

MYRON BRADFORD DIGGIN is Technical Director of the Hanson-Van Winkle-Munning Company located in Matawan, N. J. He received his B.S. degree in 1926 from Wesleyan University and majored in Chemistry. In 1928 he received his A.M. degree.

Mr. Diggin's industrial experience began when he established a consulting laboratory in New Britain, Conn. to test and compound high anti-knock gasoline. Later he joined the technical staff of the American Colloid Company in New York and in 1930 he accepted a position as chemist with Hanson-Van Winkle-Munning Company. In 1933, he became Chief Chemist of that Company and in 1946 was promoted to Technical Director.

Mr. Diggin's researches have resulted in a number of developments and patents of commercial importance, particularly in the deposition of cadmium, zinc and lead, in rack coatings and anode diaphragms and in regenerative plating systems.

Mr. Myron Diggin is Chairman of Project Committee #4 of the A.E.S. Research Committee and President of the Newark Branch. In 1946 he was awarded the Society's Gold Medal and is a member of the Electro-Chemical Society, the American Chemical Society and the American Ordinance Association. He is also very active in the Committee B8 of the American Society for Testing Materials.

PAUL B. CROLY is associated with Ontario Steel Products Company located in Chatham, Ontario with which concern he now occupies the position of Plating Superintendent.

Mr. Croly attended the University of Western Ontario from which he obtained his B.S. degree in Chemistry in 1937.

For a short period he was employed by the Beaver Wood Fibre Company, (Paper Mill), specializing in colour development work and in 1938 he joined the technical staff of Ontario Steel Products Company as Plating Chemist and later obtained his present position as Plating Superintendent..

Paul joined the Royal Canadian Air Force in 1941 and served as a Pilot until 1945.

He is Past-President of the Western Ontario Branch of the A.E.S. and also a member of the Electrochemical Society and the Chemical Institute of Canada.

EDUCATIONAL PROGRAM

2 p.m. — 4 p.m.

WALLY MARK - *Chairman*

★

M. B. DIGGIN

Technical Director

Hanson-Van Winkle-Munning Co., Matawan, N. J.

Subject: "Bright Silver Plating"

DOUG HANNA — *Associate Chairman*

P. B. CROLY

Plating Superintendent

Ontario Steel Products Co., Chatham, Ontario

Subject: "Decorative Automotive Plating"

ART SEVERS — *Associate Chairman*

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HAROLD BUNTING & ART SEVERS	*Prizes*
BOB EDWARDS	*Secretary*
TED BLANDY	*Treasurer*

Educational Session 2 p.m. to 4 p.m.

Dinner in the Ballroom 6.30 p.m.

Menu

Celery Olives Radishes

Shrimp Cocktail Mexicaine

Puree of Tomato Soup

Prime Ribs of Beef Yorkshire Pudding

Potato Chateau Lima Beans

Chef Salad

Rolls and Butter Coupe St. Jacques

Coffee

Entertainment ★ Draw for Prizes

Dancing in the Ballroom - 9 to 12

Under direction of BOB CARPENTER and his Orchestra

YEAR BOOK

ST. LOUIS BRANCH

AMERICAN ELECTROPLATERS' SOCIETY

THIRD ANNUAL SPRING BANQUET

SATURDAY, MAY 2, 1953

•

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EARLY HISTORY OF THE ST. LOUIS BRANCH AMERICAN ELECTROPLATERS' SOCIETY

(Prepared by Mr. E. J. MUSICK)

During the latter part of 1912 H. H. Williams and H. J. Richards succeeded, through their efforts in securing nine Foreman Platers to form the St. Louis Branch of the A. E. S. The first meeting was held in the assembly room of the Public Library with the nine members present.

The first officers were as follows: H. H. Williams, President; E. J. Musick Vice-President; Frank Rushton, Secretary-Treasurer and H. J. Richards, Librarian.

The first Annual Banquet was held at the American Hotel on January 24, 1914 with an attendance of 81 men, 26 of whom were Foreman Platers and who became members of the A. E. S. before December, 1914. We regret to state that only Messrs. McGinley, Hoffmeister Sr., Gaus and Musick still survive. Joe Humbrecht joined in February 1916.

The St. Louis Branch sent Messrs. Williams, Richards and Musick to Chicago for the 2nd Annual A. E. S. National Convention on June 4, 5, 6, 1914. H. H. Williams was elected 2nd Vice-President of the Supreme Society. The following branches were members at that time: New York, Chicago, Philadelphia, Newark, Dayton, Rochester, Detroit, St. Louis, Cincinnati, Milwaukee and Indianapolis.

St. Louis branch started their weekly Chemical Class in November, 1914 in the laboratory of the McKinley High School, after having been approved by the Board of Education.

Our second Annual Banquet was held on January 23, 1915 E. J. Musick presiding. Second Supreme Vice-President H. H. Williams made a splendid address. H. J. Richards who was elected to be Editor of the Supreme Society A. E. S. a few months later had the menu for the Banquet printed in his original humorous manner, as follows: Consumme, A la Potash; Oxidized Celery; Pickeled Radishes; Electric Cleaned Roast Turkey; Reversed Current Cranberry Sauce; Copper-plated Potatoes; Wired String Beans; Barrel Plated Peas; Nickel Plated Crackers and Cyanide of Coffee.

The first Annual Outing was held in Belleville at Ebsens Grove in July, 1915. G. S. Robins, Ken's father (and a very smart man), gave a talk on the superiority of single over double nickel salts. Swimming, sports of all kinds and cards were enjoyed by all.

The St. Louis Branch was host to the A. E. S. National Convention July 5, 6, and 7, 1917. It was most interesting to note the very small cost of running our convention in 1917. Receipts were $1,074.00; expenses $1,070.19; profit $3.81. Registration Fee for men was $3.00, ladies $1.50. This included an all-day trip with an executive session on the Steamer "Belle of the Bends." A sight-seeing trip of the city with a stop at the Anheuser-Busch Brewery, winding up with a Banquet and Dance at the swank Planters Hotel. We permitted no advertising or donations. The St. Louis Convention Bureau helped to pay for the Steamer and the sight-seeing tour. Since the Convention in 1917, nearly all of the then members have been officers of our Branch and three of our members have served the Supreme Society as follows: H. H. Williams, President, Secretary-Treasurer and Editor; E. J. Musick, President, Vice-President and Secretary; H. J. Richards, Editor for five years. The St. Louis Branch has two Honorary Members in the Supreme Society, namely H. H. Williams and E. J. Musick.

A PLATER'S LAMENT

By HEDLEY J. RICHARDS

A plater went to his home one night,
A solemn and a dejected sight,
He welcomed the setting sun.
He ate his supper and sought his room,
With eyes that were heavy and full of gloom,
Although his day's work was done.

For everything had gone wrong that week,
His very best tanks had started to leak,
And he couldn't make them stop,
And just because the brand was new,
The polishers kicked about the glue,
Though it came from the very same shop.

His brass solution had acted mean,
His new cleaning compound, it wouldn't clean,
Although it was well recommended.
For the dirt on the castings just seemed to stick.
He couldn't have pried it away with a pick.
His scrubbers were sorely offended.

And as he sat sadly wearily thinking,
His eyelids grew heavy and started a blinking,
And he sank in a troubled sleep.
And as he slept, he dreamed that he died,
And he passed through the Golden Gates open wide,
Where nickel solutions ain't known.

And he got fixed up with his heavenly things,
His golden harp, a pair of wings,
His troubles forever had flown.
Here silver was silver, and gold was gold,
Iron from brass could always be told,
Deception he always hated.

And looking around, his eyes always were sharp,
He happened to look rather close at his harp,
AND LO AND BEHOLD IT WAS **PLATED.**

Hed'ey Richards served both the St. Louis Branch and the Supreme Society in many capacities from 1912 until his death in 1943. He was plating foreman at the Koken Barber Supply Company until 1922 when he joined LA SALCO, INC. He retired from LA SALCO, INC. in 1938. He was well-known and loved throughout the industry for his always ready wit and humor.

DATA SHEET ON DEPOSITING CADMIUM

(Based on 100% Cathode Efficiency)

Thickness Inches	Oz. per Sq. Ft.	G. per Sq. Ft.	Amp. Hrs.	Amp. Min.	Minutes Required at Given Current Densities (Amps./Sq. Ft.) 10	15	20	25	30	40	50	75	100	125
.0001	.0720	2.04	0.974	58.4	5.8	3.9	2.9	2.3	1.9	1.5	1.2	.8	.6	.5
.00015	.108	3.06	1.46	87.6	8.8	5.8	4.4	3.5	2.9	2.2	1.8	1.2	.9	.7
.0002	.144	4.08	1.95	117.	11.7	7.8	5.8	4.7	3.9	2.9	2.3	1.6	1.2	.9
.00025	.180	5.11	2.44	146.	14.6	9.7	7.3	5.8	4.9	3.7	2.9	1.9	1.5	1.2
.0003	.216	6.13	2.92	175.	17.5	11.7	8.8	7.0	5.8	4.4	3.5	2.3	1.8	1.4
.00035	.252	7.15	3.41	205.	20.5	13.6	10.2	8.2	6.8	5.1	4.1	2.7	2.1	1.6
.0004	.288	8.17	3.90	234.	23.4	15.6	11.7	9.3	7.8	5.8	4.7	3.1	2.3	1.9
.00045	.324	9.19	4.38	263.	26.3	17.5	13.2	10.5	8.8	6.6	5.3	3.5	2.6	2.1
.0005	.360	10.2	4.87	292.	29.2	19.5	14.2	11.7	9.7	7.3	5.8	3.9	2.9	2.3
.00055	.396	11.2	5.36	321.	32.1	21.4	16.1	12.9	10.7	8.0	6.4	4.3	3.2	2.6
.0006	.432	12.3	5.84	351.	35.1	23.4	17.5	14.0	11.7	8.8	7.0	4.7	3.5	2.8
.00065	.468	13.3	6.33	380.	38.0	25.3	19.0	15.2	12.6	9.5	7.6	5.1	3.8	3.0
.0007	.504	14.3	6.82	409.	40.9	27.3	20.5	16.4	13.6	10.2	8.2	5.5	4.1	3.3
.00075	.540	15.3	7.31	438.	43.8	29.2	19.1	17.5	14.6	11.0	8.8	5.8	4.4	3.5
.0008	.576	16.3	7.79	467.	46.7	31.2	23.4	18.7	15.6	11.7	9.3	6.2	4.7	3.7
.00085	.612	17.4	8.28	497.	49.7	33.1	24.8	19.9	16.5	12.4	9.9	6.6	5.0	4.0
.0009	.648	18.4	8.76	526.	52.6	35.1	26.3	21.0	17.5	13.2	10.5	7.0	5.3	4.2
.00095	.685	19.4	9.25	555.	55.5	37.0	27.8	22.2	18.5	13.9	11.1	7.4	5.6	4.4
.001	.720	20.4	9.74	584.	58.4	39.0	29.2	23.4	19.4	14.6	11.7	7.8	5.8	4.7
.002	1.44	40.8	19.5	1170.	117.	77.9	58.4	46.7	38.9	29.2	23.4	15.6	11.7	9.3

DATA SHEET ON DEPOSITING CHROMIUM

(Based on 10% Cathode Efficiency)

Thickness in Inches	Ounces Sq. Ft.	Grams Sq. Ft.	Amp. Hrs.	Amp. Min.	Minutes Required at Given Current Densities (in Amp./Sq. Ft.) 50	75	100	125	150	175	200	250	300	400	500
.00001	.0058	0.16	5.1	310	6.1	4.1	3.1	2.4	2.0	1.7	1.5	1.3	1.0	0.76	0.61
.000015	.0087	0.25	7.7	460	9.2	6.1	4.6	3.7	3.1	2.6	2.3	1.9	1.5	1.1	0.92
.00002	.012	0.33	10.	610	12.	8.1	6.1	4.9	4.1	3.5	3.1	2.5	2.0	1.5	1.2
.000025	.015	0.41	13.	760	15.	10.	7.6	6.1	5.1	4.4	3.8	3.1	2.6	1.9	1.5
.00003	.017	0.49	16.	920	18.	12.	9.3	7.3	6.1	5.2	4.6	3.8	3.1	2.3	1.9
.00004	.023	0.66	21.	1200	24.	16.	12.	9.8	8.1	7.0	6.1	5.0	4.1	3.1	2.5
.00005	.029	0.82	26.	1500	31.	21.	16.	12.	10.	8.7	7.7	6.3	5.1	3.9	3.1

DATA SHEET ON DEPOSITING COPPER USING AN ACID SOLUTION

(Based on 97% Cathode Efficiency; 2-valent Copper)

hickness in Inches	Oz. per sq. ft.	Grams per sq. ft.	Amp. Hrs. needed	Amp. Min. needed	Minutes for Obtaining Coating at Various Amperes per Sq. Ft.										
					10 Amp.	15 Amp.	20 Amp.	25 Amp.	30 Amp.	40 Amp.	50 Amp.	75 Amp.	100 Amp.	125 Amp.	150 Amp.
00001	.0074	.209	.18	10.9	1.1	.7	.6	.5	.4	.3	.3	.2	.1	.1	.1
00002	.0148	.418	.36	21.8	2.2	1.6	1.1	.9	.7	.6	.5	.3	.2	.2	.2
00003	.0222	.627	.55	32.7	3.27	2.2	1.6	1.3	1.1	.8	.7	.5	.3	.3	.2
00004	.0295	.836	.73	43.6	4.36	2.9	2.2	1.7	1.5	1.1	.9	.6	.4	.4	.3
00005	.0369	1.046	.91	54.5	5.45	3.6	2.7	2.2	1.8	1.4	1.1	.7	.6	.5	.4
00006	.0443	1.254	1.09	65.4	6.54	4.4	3.3	2.7	2.2	1.6	1.3	.9	.7	.5	.5
00007	.0517	1.463	1.27	76.4	7.64	5.0	3.8	3.1	2.6	1.9	1.5	1.1	.8	.6	.5
00008	.0591	1.672	1.45	87.2	8.72	5.8	4.4	3.5	2.9	2.2	1.8	1.2	.9	.7	.6
00009	.0666	1.882	1.64	98.2	9.82	6.6	5.0	4.3	3.3	2.5	2.0	1.3	.98	.8	.7
0001	.0739	2.09	1.82	109.0	10.9	7.3	5.5	4.4	3.6	2.7	2.2	1.5	1.1	.9	.7
0002	.1476	4.18	3.63	218.0	21.8	14.5	10.9	8.7	7.3	5.5	4.4	2.9	2.2	1.7	1.5
0003	.222	6.27	5.45	326.5	32.6	21.7	16.3	13.1	10.9	8.2	6.5	4.4	3.3	2.6	2.2
0004	.295	8.36	7.26	435.5	43.5	29.1	21.8	17.4	14.5	10.9	8.7	5.8	4.4	3.5	2.9
0005	.369	10.46	9.08	545.0	54.5	36.3	27.2	21.8	18.2	13.6	10.9	7.3	5.5	4.4	3.7
0006	.443	12.54	10.9	654.0	65.4	43.6	32.6	26.1	21.8	16.3	13.1	8.7	6.6	5.3	4.4
0007	.517	14.63	12.72	764.0	76.4	50.8	38.1	30.5	25.4	19.1	15.3	10.2	7.7	6.1	5.1
0008	.591	16.72	14.51	872.0	87.2	58.1	43.6	34.8	29.1	21.8	17.4	11.6	8.8	7.0	5.8
0009	.666	18.82	16.37	982.0	98.2	65.4	49.1	39.2	32.7	24.55	19.6	13.1	9.9	7.8	6.6
001	.739	20.92	18.16	1090.0	109.0	72.5	54.5	43.5	36.25	27.2	21.8	14.5	10.9	8.7	7.2
002	1.476	41.84	36.32	2180.0	218.0	145.0	109.0	87.0	72.5	54.4	43.5	29.0	21.8	17.4	14.5

DATA SHEET ON DEPOSITING COPPER USING A CYANIDE SOLUTION

(Based on 60% Cathode Efficiency; 1-valent Copper)

Thickness in Inches	Oz. per sq. ft.	Grams per sq. ft.	Amp. Hrs. needed	Amp. Min. needed	Minutes for Obtaining Coating at Various Amperes per Sq. Ft.										
					5 Amp.	7 Amp.	10 Amp.	15 Amp.	20 Amp.	25 Amp.	30 Amp.	40 Amp.	50 Amp.	75 Amp.	100 Amp.
.00001	.0074	.209	.14	8.7	1.74	1.25	.87	.58	.44	.35	.29	.22	.17	.12	.09
.00002	.0148	.418	.29	17.4	3.49	2.49	1.74	1.16	.87	.7	.58	.44	.34	.24	.18
.00003	.0222	.627	.44	26.2	5.24	3.74	2.62	1.74	1.31	1.05	.87	.66	.52	.35	.26
.00004	.0295	.836	.58	34.8	6.95	4.98	3.48	2.32	1.74	1.39	1.16	.87	.70	.47	.35
.00005	.0369	1.046	.72	43.5	8.73	6.22	4.35	2.9	2.18	1.74	1.45	1.09	.87	.58	.44
.00006	.0443	1.254	.87	52.3	10.46	7.49	5.23	3.49	2.62	2.1	1.74	1.31	1.05	.70	.52
.00007	.0517	1.463	1.02	61.0	12.2	8.72	6.10	4.06	3.05	2.44	2.03	1.53	1.22	.81	.61
.00008	.0591	1.672	1.16	69.7	13.95	9.97	6.97	4.65	3.48	2.79	2.32	1.74	1.39	.93	.70
.00009	.0666	1.882	1.31	78.4	15.6	11.20	7.84	5.22	3.91	3.13	2.61	1.96	1.56	1.05	.78
.0001	.0739	2.09	1.45	87.0	17.4	12.5	8.7	5.8	4.4	3.5	2.9	2.2	1.7	1.2	.9
.0002	.1476	4.18	2.9	174.0	34.9	24.9	17.4	11.6	8.7	7.	5.8	4.4	3.4	2.4	1.8
.0003	.222	6.27	4.37	262.0	52.4	37.4	26.2	17.4	13.1	10.5	8.7	6.6	5.2	3.5	2.6
.0004	.295	8.36	5.8	348.0	69.5	49.8	34.8	23.2	17.4	13.9	11.6	8.7	7.0	4.7	3.5
.0005	.369	10.46	7.25	435.0	87.3	62.2	43.5	29.0	21.8	17.4	14.5	10.9	8.7	5.8	4.4
.0006	.443	12.54	8.72	523.0	104.6	74.9	52.3	34.9	26.2	21.0	17.4	13.1	10.5	7.0	5.2
.0007	.517	14.63	10.2	610.0	122.0	87.2	61.0	40.6	30.5	24.4	20.3	15.3	12.2	8.1	6.1
0008	.591	16.72	11.6	697.0	139.5	99.7	69.7	46.5	34.8	27.9	23.2	17.4	13.9	9.3	7.0
.0009	.666	18.82	13.1	784.0	156.0	112.0	78.4	52.5	39.1	31.3	26.1	19.6	15.6	10.5	7.8
.001	.739	20.92	14.5	870.0	174.0	125.0	87	58	44	35	29	22	17	12	9
.002	1.476	41.84	29.0	1740.0	349.0	249.0	174	116	87	70	58	44	34	24	18

METAL CONTENT OF COMMON PLATING SALTS

By Nathan E. Promisel *Washington, D. C.*

(**Note:** Technical products usually vary slightly from stated percentages.)

Technical Name of Salt	Chemical Formula	Per Cent Metal
Antimony trichloride	$SbCl_3$	53.4
Cadmium cyanide	$Cd\ (CN)_2$	68.3
Cadmium oxide	CdO	87.5
Chromic acid	CrO_3	52.0
Cobalt sulfate (anhydrous)	$CoSO_4$	38.0
Cobalt sulfate, crystal	$CoSO_4 \cdot 7H_2O$	21.0
Copper carbonate (basic)	$CuCO_3 \cdot Cu(CH)_2$	57.5
Copper chloride (ic)	$CuCl_2$	47.3
Copper cyanide (ous)	$Cu_2(CN)_2$	71.0
Copper fluoborate	$Cu(BF_4)_2$	26.8
Copper sulfate (ic), crystal	$CuSO_4 \cdot 5H_2O$	25.5
Ferrous chloride, crystal	$FeCl_2 \cdot 4H_2O$	28.1
Ferrous ammonium sulfate	$FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$	14.2
Gold chloride (ic)	$AuCl_3$	64.9
Gold chloride (ic), crystals	$AuCl_3 \cdot 2H_2O$	58.1
Gold chloride (ous)	$AuCl$	84.7
Gold cyanide (ous)	$AuCN$	88.3
Gold potassium cyanide	$KAu(CN)_2$	68.3*
Gold potassium cyanide, crystal	$KAu(CN)_2 \cdot 2H_2O$	60.8
Gold sodium cyanide	$NaAu(CN)_2$	72.5*
Indium chloride	$InCl_3$	51.8
Indium cyanide	$In(CN)_3$	59.4
Indium sulfate	$In_2(SO4)_3$	33.7
Lead carbonate (basic)	$Pb(OH)_2 \cdot 2PbCO_3$	80.1
Lead fluoborate	$Pb\ (BF_4)_2$	54.4
Mercuric chloride	$HgCl_2$	73.8
Mercuric cyanide	$Hg(CN)_2$	79.4
Mercuric nitrate	$Hg(NO_3)_2$	61.8
Mercuric nitrate, crystal	$Hg(NO_3)_2 \cdot H_2O$	58.6
Nickel ammonium sulfate (double nickel salts)	$NiSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$	14.9
Nickel carbonate (basic)	$2NiCO_3 \cdot 3Ni(OH)_2 \cdot 4H_2O$	50.0
Nickel chloride, crystal	$NiCl_2 \cdot 6H_2O$	24.7
Nickel sulfate (single nickel salt)	$NiSO_4 \cdot 7H_2O$	20.9
Platinum chloride, crystal	$H_2PtCl_6 \cdot 6H_2O$	37.7
Rhodium phosphate, crystal	$RhPO_4 \cdot 3H_2O$	29.9
Rhodium sulfate, crystal	$Rh_2(SO_4)_3 \cdot 12H_2O$	29.0
Silver chloride	$AgCl$	75.3
Silver cyanide	$AgCN$	80.5
Silver potassium cyanide	$KAg(CN)_2$	54.2
Silver sodium cyanide	$NaAg(CN)_2$	59.0
Silver nitrate	$AgNO_3$	63.5
Sodium stannate, crystal	$Na_2SnO_3 \cdot 3H_2O$	44.5
Tin chloride (ous), crystal	$SnCl_2 \cdot 2H_2O$	52.6
Tin fluoborate	$Sn(BF_4)_2$	40.6
Tin sulfate (ous)	$SnSO_4$	55.3
Tungstic acid	H_2WO_4	73.6
Tungstic oxide	WO_3	79.3
Zinc cyanide	$Zn(CN)_2$	55.7
Zinc fluoborate	$Zn(BF_4)_2$	27.3
Zinc oxide	ZnO	80.3
Zinc sulfate, crystal	$ZnSO_4 \cdot 7H_2O$	22.7

*Technically salts may contain appreciably less, and gold content is usually stated on container.

The New MOTOR-GENERATOR

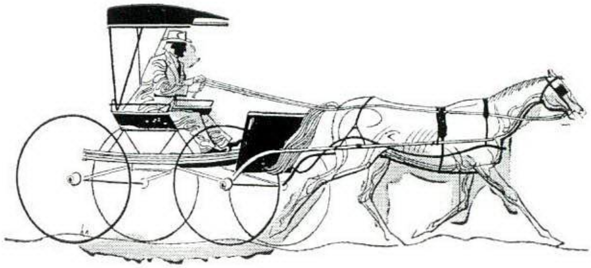
- GREATER ACCESSIBILITY
- BETTER COMMUTATION
- LONGER BRUSH LIFE
- INCREASED RESERVE CAPACITY
- IMPROVED BRUSH HOLDER

with 85% OVERALL POWER EFFICIENCY!

for the

ELECTROPLATING INDUSTRY

Perhaps YOU WERE NOT YET BORN

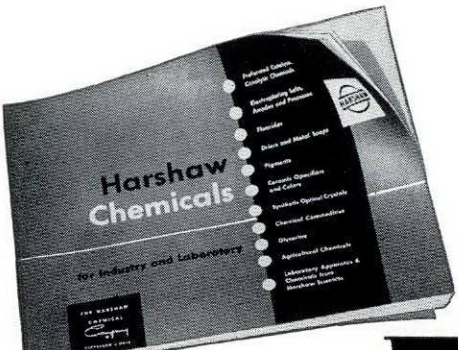


when Harshaw first produced plating materials

Then again, perhaps you plated with Harshaw nickel as far back as the year 1898 . . . when we started producing for the plating industry.

If you are an old-timer, then you know first-hand the dependability of Harshaw plating materials. And you know how often Harshaw has been FIRST with important new developments . . . For instance, back in the 20's when our discoveries brought "rolled depolarized and rolled carbon" nickel anodes, and in 1934 when Harshaw developed "Nibrite," the first *bright* nickel. Harshaw installed the first commercial bright electroplating bath in 1935.

That was a famous first, as you will recall. Of equal importance, too, were our introductions of fine crystal single nickel salts, and Perflow, the first truly leveling nickel deposit.



If you're a youngster, well then you should know more about us, and for that reason we have prepared a 16-page booklet which tells all about us — how thoroughly we serve the plating industry, and other major industries such as ceramic, petroleum, metalworking, paint, and others as well. Write for this free booklet. We'll be happy to send it.

THE HARSHAW CHEMICAL CO.
1945 East 97th Street, Cleveland 6, Ohio
BRANCHES IN PRINCIPAL CITIES

BUFFING AND POLISHING WHEEL SPEEDS

SURFACE SPEED OF WHEEL IN FEET PER MINUTE

R. P. M. at Arbor or Spindle	DIAMETERS OF WHEELS IN INCHES											R. P. M. at Arbor or Spindle
	4″	6″	8″	10″	12″	14″	16″	18″	20″	22″	24″	
800	837	1256	1675	2094	2513	2932	3351	3770	4189	4608	5026	800
900	942	1413	1885	2356	2827	3298	3770	4241	4712	5184	5655	900
1000	1047	1570	2094	2618	3141	3665	4189	4712	5236	5760	6283	1000
1100	1152	1727	2304	2880	3455	4031	4608	5183	5760	6336	6911	1100
1200	1256	1884	2513	3142	3769	4398	5027	5655	6283	6912	7540	1200
1300	1361	2042	2723	3404	4084	4764	5446	6126	6807	7488	8168	1300
1400	1466	2199	2932	3666	4398	5131	5865	6597	7330	8064	8796	1400
1500	1571	2356	3142	3927	4712	5497	6284	7069	7854	8640	9425	1500
1600	1675	2513	3351	4189	5026	5864	6703	7540	8378	9216	10053	1600
1700	1780	2670	3560	4451	5340	6230	7121	8011	8901	9792	10681	1700
1800	1885	2827	3770	4713	5654	6597	7540	8482	9425	10368	11310	1800
1900	1989	2984	3979	4975	5969	6963	7959	8954	9948	10944	11938	1900
2000	2094	3141	4189	5236	6283	7330	8378	9425	10472	11520	12566	2000
2100	2199	3298	4398	5498	6597	7696	8797	9896	10996	12096	13194	2100
2200	2304	3455	4608	5760	6911	8063	9215	10367	11519	12672	13822	2200
2300	2408	3612	4817	6022	7225	8429	9634	10839	12043	13248	14451	2300
2400	2513	3770	5027	6284	7540	8796	10053	11310	12566	13824	15079	2400
2500	2618	3927	5236	6545	7854	9162	10471	11781	13090	14400	15708	2500
2600	2722	4084	5445	6807	8168	9529	10890	12253	13613	14976	16336	2600
2700	2827	4241	5655	7069	8482	9895	11309	12724	14136	15552	16964	2700
2800	2932	4398	5864	7331	8796	10262	11728	13196	14660	16128	17592	2800
2900	3037	4555	6074	7592	9110	10629	12147	13667	15184	16704	18221	2900
3000	3141	4712	6283	7854	9425	10996	12566	14137	15708	17280	18850	3000
3200	3351	5026	6702	8378	10053	11729	13404	15079	16755	18431	20107	3200
3400	3560	5340	7121	8901	10681	12462	14242	16022	17802	19583	21363	3400
3600	3769	5654	7539	9425	11309	13193	15079	16964	18850	20735	22619	3600
3800	3979	5969	7958	9948	11938	13927	15917	17907	19897	21887	23876	3800
4000	4188	6283	8377	10472	12566	14661	16755	18850	20944	23039	25132	4000

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AMOUNT OF CYANIDE REQUIRED TO DISSOLVE

COMMONLY USED METALLIC CYANIDES AND OXIDES

(Courtesy — Kocour Co.)

To Dissolve 1 Lb. Cadmium Oxide - - 1.1 Lb. Sodium Cyanide

To Dissolve 1 Lb. Copper Cyanide - - 1.2 Lb. Sodium Cyanide

To Dissolve 1 oz. Silver Cyanide - - - 0.37 oz. Sodium Cyanide or 0.48 oz. Potassium Cyanide

To Dissolve 1 Lb. Zinc Cyanide - - - - 0.85 Lb. Sodium Cyanide

To Dissolve 1 Lb. Zinc Oxide - - - - - 1.2 Lb. Sodium Cyanide

TABLE SHOWING SIZE OF MAIN CONDUCTORS (COPPER)

Dynamo Amperes	5 to 20 Feet		20 to 35 Feet		35 to 50 Feet		50 to 65 Feet	
	Round Bars	Flat Bars	Round Bars	Flat Bars	Round Bars	Flat Bars	Round Bars	Flat Bars
100	5/16	....	3/8	....	7/16	....	1/2	....
200	1/2	....	9/16	....	5/8	....	3/4	....
300	9/16	....	11/16	....	3/4	....	1	1 5/8 x 1/2
500	3/4	....	7/8	....	1	1 5/8 x 1/2	1 1/8	2 x 1/2
750	7/8	....	1 1/8	2 x 1/2	1 3/16	2 1/4 x 1/2	1 3/8	3 x 1/2
1,000	1	1 5/8 x 1/2	1 1/4	2 1/2 x 1/2	1 3/8	3 x 1/2	1 1/2	3 1/2 x 1/2
1,500	1 1/4	2 1/2 x 1/2	1 1/2	3 1/2 x 1/2	1 3/4	4 x 5/8	1 7/8	3 3/4 x 3/4
2,000	1 1/2	3 1/2 x 1/2	1 3/4	4 x 5/8	2	4 1/4 x 3/4	2 1/8	4 x 7/8
2,500	1 9/16	3 x 5/8	1 7/8	3 3/4 x 3/4	2 3/16	5 x 3/4	2 3/8	4 1/2 x 1
3,000	1 3/4	4 x 5/8	2 1/8	4 x 7/8	2 5/8	4 1/2 x 1	2 5/8	4 3/8 x 1 1/4
4,000	2	4 1/4 x 3/4	2 1/2	5 x 1	2 3/4	4 3/4 x 1 1/4	3	4 3/4 x 1 1/2
5,000	2 1/4	4 1/2 x 7/8	2 3/4	4 3/4 x 1 1/4	....	5 1/4 x 1 3/4	3 3/4	5 1/2 x 2
7,500	2 3/4	4 3/4 x 1 1/4	....	5 1/2 x 1 3/4	....	5 1/2 x 2	4 1/4	7 x 2

DATA SHEET ON DEPOSITING ZINC USING A CYANIDE SOLUTION

(Based on 70% Cathode Efficiency)

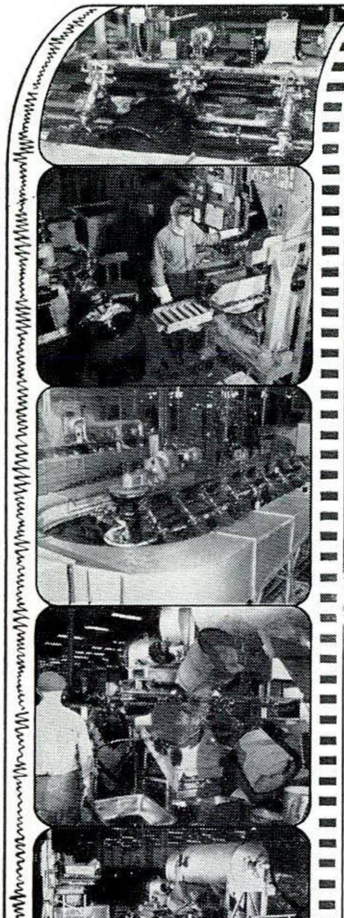
ick-ss in ches	Oz. per sq. ft.	Grams per sq. ft.	Amp. Hrs. needed	Amp. Min. needed	Minutes for Obtaining Coating at Various Amperes per Sq. Ft.													
					5 Amp.	7 Amp.	10 Amp.	12 Amp.	15 Amp.	20 Amp.	25 Amp.	30 Amp.	35 Amp.	40 Amp.	45 Amp.	50 Amp.	60 Amp.	70 Amp.
0001	.0058	.165	.191	11.5	2.30	1.64	1.15	.96	.76	.58	.46	.38	.33	.28	.26	.23	.19	.17
0002	.0116	.330	.382	22.9	4.58	3.28	2.29	1.91	1.53	1.15	.92	.75	.66	.57	.51	.46	.38	.33
0003	.0175	.495	.574	34.4	6.88	4.92	3.44	2.87	2.3	1.72	1.38	1.15	.98	.86	.77	.69	.58	.49
0004	.0233	.661	.765	45.9	9.18	6.55	4.59	3.82	3.06	2.3	1.84	1.53	1.31	1.15	1.02	.92	.76	.66
0005	.029	.826	.956	57.3	11.48	8.2	5.74	4.79	3.82	2.87	2.3	1.91	1.64	1.43	1.27	1.15	.96	.82
0006	.035	.991	1.147	68.8	13.76	9.83	6.88	5.74	4.59	3.44	2.76	2.3	1.97	1.72	1.53	1.38	1.15	.98
0007	.041	1.15	1.336	80.2	16.04	11.45	8.02	6.68	5.35	4.02	3.2	2.67	2.3	2.01	1.78	1.61	1.34	1.15
0008	.046	1.32	1.53	91.8	18.4	13.1	9.2	7.65	6.12	4.59	3.58	3.06	2.62	2.3	2.04	1.84	1.53	1.31
0009	.052	1.48	1.72	103	20.6	14.7	10.3	8.58	6.86	5.15	4.12	3.43	2.94	2.57	2.3	2.1	1.72	1.47
001	.0583	1.65	1.91	114.5	23	16.35	11.5	9.55	7.64	5.73	4.58	3.82	3.27	2.87	2.55	2.3	1.91	1.64
002	.116	3.30	3.82	229	45.8	32.8	22.9	19.1	15.27	11.45	9.15	7.54	6.55	5.72	5.09	4.6	3.82	3.28
003	.174	4.95	5.74	344	68.8	49.2	34.4	28.7	23	17.2	13.8	11.5	9.84	8.6	7.7	6.9	5.8	4.9
004	.233	6.61	7.65	459	91.8	65.5	45.9	38.2	30.6	23	18.4	15.3	13.1	11.5	10.2	9.2	7.6	6.6
005	.291	8.26	9.56	574	114.8	82	57.4	47.9	38.2	28.7	23	19.1	16.4	14.3	12.7	11.5	9.6	8.2
006	.349	9.91	11.47	688	137.6	98.3	68.8	57.4	45.9	34.4	27.6	23	19.7	17.2	15.3	13.8	11.5	9.8
007	.408	11.56	13.36	802	160.4	114.5	80.2	66.8	53.5	40.2	32	26.7	23	20.1	17.8	16.1	13.4	11.5
008	.466	13.22	15.3	918	184	131	91.8	76.5	61.2	45.9	35.8	30.6	25.2	23	20.4	18.3	15.3	13.1
009	.524	14.87	17.2	1030	206	147	103	85.8	68.6	51.5	41.2	34.3	29.4	25.7	23	20.6	17.2	14.7
01	.583	16.52	19.1	1145	229	163.5	114.5	95.5	76.4	57.3	45.8	38.2	32.7	28.7	25.5	23	19.1	16.4
02	1.166	33.05	38.2	2290	458	328.0	229	191	152.7	114.5	91.5	75.4	65.5	57.2	50.9	45.8	38.2	32.8

ELECTROCHEMICAL EQUIVALENTS

Element	Symbol	Valance	At 100% Efficiency		Ounces per sq. ft. at .001″ deposit	A.H. per sq. ft. to deposit 0.001″ (1)
			Gr/AH	Oz/AH		
Cadmium	Cd.	2	2.097	.074	.71	9.71
Chromium	Cr.	6	.323	.0114	.59	51.50
Copper (Acid)	Cu.	2	1.186	.042	.74	17.70
Copper (Cn.)	Cu.	1	2.372	.084	.74	8.85
Gold (Acid)	Au.	3	2.452	.079(2)	1.44	18.70
Gold (Cn.)	Au.	1	7.357	.236(2)	1.44	6.20
Lead	Pb.	2	3.865	.136	.94	6.90
Nickel	Ni.	2	1.095	.039	.74	18.70
Platinum	Pt.	4	1.821	.058(2)	1.60	27.70
Silver	Ag.	1	4.025	.129(2)	.79	6.20
Tin (Acid)	Sn.	4	1.107	.039	.61	15.6
Tin (Stannato)	Sn.	2	2.214	.078	.61	7.80
Zinc (Cn.)	Zn.	2	1.219	.043	.59	13.7
Zinc (Acid)	Zn.	2	1.219	.043	.59	13.7

(1) These values are based on 100 percent current efficiency. In applying them it is necessary to take into account the actual cathode efficiencies.

(2) Troy ounces.



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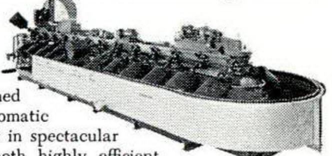

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1:00 P.M. to 1:45 P.M.

Main Lobby — Hotel Kimball

TECHNICAL PROGRAM

1:45 P.M. to 5 P.M.

MAIN BALLROOM — HOTEL KIMBALL

Chairman — FRANCIS T. EDDY, Chase Brass and Copper Co.

Movie: "Dare Devils on Ice and Water Sports"

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LADIES' PROGRAM

REGISTRATION

1:00 P.M. to 2:00 P.M.

Main Lobby — Hotel Kimball

SOCIAL HOUR

2:00 P.M. to 3:00 P.M.

Main Dining Room

Your ladies' committee will see that you meet everyone and will provide flowers for each and all, and there will be Johnny Brogan, the well known pianist to entertain you.

3:00 P.M. to 4:30 P.M.

A rate treat for you ladies "The Romance of Gems" a talk by Orlando S. Paddock. Mr. Paddock is manager of the Diamond Department of Tilden-Thurber, Providence, Rhode Island and a certified gemologist. He is a most entertaining speaker, thoroughly enthused with his subject which is new and thrilling and replete with fabulous tales of beautiful gems. For illustration there will be a dazzling display of gems to show you.

This will be a memorable occasion. Don't miss it.

BANQUET

6:30 P.M.

Main Ball Room

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AU GRATIN POTATOES   GREEN PEAS

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WITH FRESH STRAWBERRY SAUCE

COFFEE

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9:00 P.M.

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40th ANNUAL NATIONAL CONVENTION

BENJAMIN FRANKLIN HOTEL

PHILADELPHIA, PA.

JUNE 15-18, 1953

THE PROCTOR DIAMOND JUBILEE
Founder's Day
Celebration

An Open Meeting and Banquet, Entertainment

and Dance

Held by the

New York Branch

American Electroplaters' Society

at the

Hotel Pennsylvania

New York

February 22, 1941

THE PROCTOR DIAMOND JUBILEE

A Foreword from the General Chairman

A Red Letter Day, today, in the annals of the New York Branch of the A. E. S. — one that we have long looked forward to! This is the day when we pay tribute to the one who, in the early years of the century, when this industry was cradling, had the concept and the courage to organize this Society, through which so many of us have found economic security and an avenue to scientific and social progress.

This is not a formal testimonial to some genius or hero; rather is it an expression of good will and gratitude to the able and progressive personality who as we have said, had the vision and perseverance to bring this organization into being. We feel that we owe him much, and we take this way of manifesting our feeling.

Our Committees are grateful for the assistance of our members, and the support of our friends in sister Branches. To our suppliers—our hearty thanks for their ever-ready help.

And to all of you here with us tonight—we wish the best of good times!

FRANKLYN J. MacSTOKER.

FRANKLYN J. MacSTOKER
General Chairman

ONE OF AMERICA'S ANCIENT AND HISTORIC CITIES

INVITES YOU

To The

29th ANNUAL NATIONAL CONVENTION

Of

The AMERICAN ELECTROPLATERS' SOCIETY

To Be Held At

Boston, Mass., June 9th, 10th, 11th, 12th 1941

YOUR CONVENTION HEADQUARTERS
"UNDER ONE ROOF"

HOTEL STATLER

"See America's Historic Shrines"

For Details write to:

JOE BARRON — National Convention Chairman
143 Sidney St., Cambridge, Mass.

LOOKING BACKWARD AND FORWARD

A Greeting From the Founder

☆ ☆ ☆ ☆ ☆ ☆

The month of February is historic in America. Two of our greatest men first saw life in this month, Abraham Lincoln, the Liberator, and George Washington, the Father of our country. Both lived in times of turmoil and bloodshed, but Right makes Might, and eventually, a greater America was born — an America that stands united today, an America that asks only to continue in Peace and Good Will towards men. Of all nations, America must be the arbiter of Peace; that is her destiny in the future years.

CHARLES H. PROCTOR
Founder,
American Electroplaters' Society

On February 25th, 1866, I first saw the light of day and my memory goes back to 1874 when I was eight years of age and it seems that I first began to think. What wonders has man wrought since then! Since I first set foot on American soil in New York on October 23rd, 1881, I have beheld the unfolding of a Great Nation, seen America proceed to her destiny.

There is a Biblical saying that "As a man thinketh, so is he." To have been a leading factor in the creation of the American Electroplaters' Society in New York is honor enough in itself, but to have lived through its late years, to have been a part of its wonderful development is added glory. The American Electroplaters' Society is a great practical, educational Society, the only one of its type in America and probably in the world. To every member of the Society wherever he may be, I say that the future of the Society belongs to you, and I leave it in your hands. I know it will be safe. To all members of our beloved Society, wherever they may reside, I send my sincerest wish for Peace, Prosperity and Happiness to them and theirs.

The honor that you have conferred upon me as the Founder of your Society, by holding a Proctor Diamond Jubilee, will live with me in all of my future years.

CHARLES H. PROCTOR.

☆ ☆ ☆ ☆ ☆ ☆

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THE NEW YORK BRANCH
of the
AMERICAN ELECTROPLATERS' SOCIETY

Thirty-two years ago in January 1909, Charles H. Proctor, then a young but progressive and far-seeing electro-plater, appealed to his fellow craftsmen in America to form a national educational society to raise the standards of the industry and to improve the position of the men engaged in it. His appeal evoked an enthusiastic response and a meeting was held on March 6th at the Hotel Chelsea, New York, where a committee was appointed to select a name and draft a constitution.

A month later, on April 10, 1909, the National Electroplaters' Association of United States and Canada held its first regular meeting and started out in life with sixty members. Thus was born the organization from which the present far-flung, useful and influential American Electroplaters' Society has grown.

During that first year the scope of the Society was also determined. It was definitely decided that economic problems, questions concerning capital and labor, were not to be included in the Society's activities. The platers' organization was not to be a union, but a technical society, devoted to the education of its members and the advancement of its art. This was a wise decision.

The establishment in rapid succession of branches in Rochester, Indianapolis, Detroit, Chicago, Toronto, Milwaukee, St. Louis, Dayton and Newark resulted in the operation of the organization as a truly national body, and the first National Convention was held on February 1, 1913, at the Broadway Central Hotel in New York. The Constitution was revised and the name changed to "The American Electroplaters' Society." From that time on the New York organization has operated as a Branch and confined its activities to local problems and local betterment.

It has been said truly that history concerns itself largely with war and not with peace; that tales of peace make dull reading. So the history of the New York Branch after 1915 might be called "dull" or "unromantic". Actually, however, those years were full of activity and life. They were a period of steady and sometimes rapid growth; of increasing influence and usefulness to the members of the Branch and to the electro-plating industry.

During these times we saw the first of the attempts in the Metropolitan area toward an educational training program. Many obstacles had to be overcome, but progress was made. One early class, under Mr. Joseph Haas, (still a member of the New York Branch, and at one time an Associate editor of **The Monthly Review** and **The Brass World)** progressed for some time. It was succeeded by other groups in various of the City schools and colleges.

Work such as this, along with the general program of the National Society, on the part of the New York members, kept the Branch in the forefront, these members in some instances being appointed or selected to major committees of the supreme body. Thus in 1924, John E. Sterling, a past secreary-treasurer of the Branch was elected to the presidency of the National Society.

More recently (in 1937) the New York Branch was host to the Silver Jubilee Convention, which marked a quarter-century of progress.

To be sure, none of these developments were spontaneous. Great events do not "happen." They are brought about by far-sighted and courageous individuals. So the birth of the American Electroplaters' Society in New York and the growth of the New York Branch throughout the years were the result of the unremitting and untiring efforts of many unselfish and broad-minded members of the Branch.

And although limitations of space make it impossible to list here the names of all of those pioneers, no space could be too small to mention, and no space could be large enough to do justice to the leader of this movement, the man whose vision, energy and ability brought the Society into being and then supplied far more than one man's share of the power for its continued growth.

It is that man whom the New York Branch meets to honor on his Diamond Jubilee—his 75th birthday—our distinguished Founder—Charles H. Proctor.

A WORD OF THANKS

We are impelled to say a word of thanks and appreciation. We members of the American Electroplaters' Society all know that the suppliers are our friends. They have helped us, done us many favors and rendered us many services as their customers. But here—in this booklet—which we hope you Readers will keep for its permanent value and as a memento of this occasion —they have helped us in even more definite and concrete form—financing—by way of purchasing space. This Program was made possible only by the help of our friends who advertised therein, shouldering the burden of its cost.

We are, therefore, happy to express our appreciation publicly. We ask also that our members and guests and other readers of this publication respond in kind, to the help given by our friends, and purchase their supply needs from them. They are all reputable and upstanding firms. They stand behind their products and sell good merchandise. It will pay to buy it.

RALPH J. LIGUORI
President, New York Branch

MRS. LOUIS S. CATES
Chairlady, Committee of Ladies

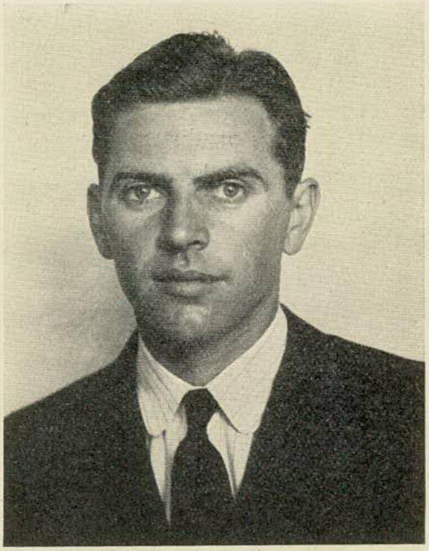
THE EDUCATIONAL PROGRAM

— 2:30 P. M. —

Presiding Officer

EDWIN C. RINKER

Librarian, New York Branch, A. E. S.



EDWIN C. RINKER

"ELECTROLYTIC POLISHING"—by Harold M. Lang,
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"BRIGHT COPPER"—by Dr. Louis Weisberg,
Consulting Chemical Engineer, New York

⁘ ⁘ ⁘

"FABRICATION OF COPPER & COPPER ALLOYS"
and Motion Picture "From Mine to Consumer"
by Ellsworth Candee,
American Brass Co., Waterbury, Conn.

ADOLPH BREGMAN
Chairman, Jubilee Journal Committee

Menu

Sea Food Cocktail

* * *

Potage Ambassador

* * *

Celery *Olives*

* * *

Filet of Sole Bonne Femme

* * *

Roast Turkey, Cranberry Sauce
Candied Sweet Potatoes
New Peas
Salad in Season

* * *

Bombe Pennsylvania
Cakes

* * *

Cafe

PROGRAMME

OF

Music & Entertainment

American Electroplaters' Society

FEBRUARY 22, 1941 HOTEL PENNSYLVANIA

LIONEL CINAMON
Chairman, Entertainment Committee

ART PAULSON & HIS HOTEL NEW YORKER ORCHESTRA

1. LANE & WARD

Youthful Boy and Girl sensational comedy Dancers . . . Now appearing with Glen Miller and His Orchestra, at the New York Paramount Theatre . . . also currently appearing in the sensational Broadway Musical Comedy Show, "Crazy With the Heat."

2. GENE MARVEY

Handsome Young American Tenor . . . acclaimed by over two million people for his excellent singing . . . featured tenor of the production "American Jubilee" at the New York World's Fair . . . also singing star of the show "Life Begins at 8:40" . . . and many other successes . . .

3. RODNEY & GOULD

2 men . . . most unusual comedy act . . . "Exponents of Laffs," featured at all deluxe theatres . . .

4. KEN WHITMER

"The King of Instrumentalists and his Aces." Expert Impersonator of Orchestra leaders . . . talented player of thirty-five musical instruments . . .

5. MAUREEN & NORVA

Extraordinary Dancing Stars of the motion picture "Viva Villa" with Wallace Beery . . . late feature of many Broadway successes . . . Persian Room of the Plaza Hotel . . . etc. They will also teach the "Conga" and the entire audience will participate .. .

SIMPLE METHODS OF DETERMINING SURFACE TENSION

STALAGMOMETER

When determining the surface tension of plating or other solutions with the stalagmometer, most of the calculations may be avoided by the employment of the nomograph (Figure 3) which has been prepared according to the formula:

Surface Tension = 72 × Sp. gr. × (Drops of Water/Drops of Solution).

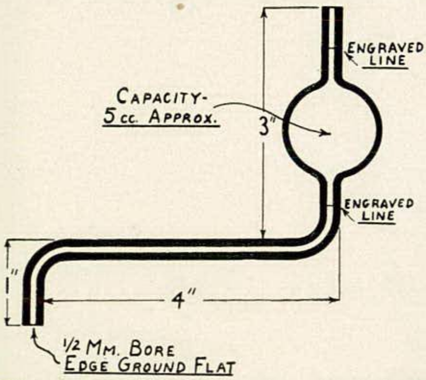
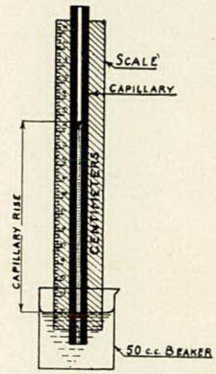


Fig. 1. (Left) Construction of a stalagmometer.

Fig. 2. (Right) The capillary setup.



The only calculation involved is the ratio of the number of drops of water to the number of drops of the solution. If a straight edge or ruler is placed at the number on the right hand line corresponding to the ratio and continued through the Baume reading of the solution, it will intersect the left hand line at the surface tension of the solution.

Example: Density of solution is 10° Baume
Drops of water delivered by stalagmometer = 53
Drops of solution " " " = 105
Ratio: (Drops of Water/Drops of Solution) = 53/105 = 0.505

Setting the ruler at 0.505 on the right hand side of the nomograph and continuing through 10 degrees Baume, the result is read as 39.1 dynes, as shown by the broken line on the nomograph (Figure 3).

CAPILLARY RISE

The equipment required for this test consists of a 50 cc. beaker or other small container at least 1.5 inches in diameter, a glass capillary tube between 0.2 and 0.5 mm. in diameter and a centimeter scale, as shown in Figure 2. An excellent capillary can be made from an engraved scale glass thermometer with a range from —20°C. to 120°C. A length of 10 or 12 inches is satisfactory and the length in centimeters per degree of graduation can be easily determined by comparison with a centimeter scale. The bore of the capillary must be approximately circular in shape. The bore is determined by measuring the capillary rise with distilled water in the capillary tube and substituting in the formula: $\text{Bore (in cm.)} = \frac{\text{Surface Tension}}{245.3 \times h \times d}$

Where h is the capillary rise in centimeters and d is the density of the water which may be taken as unity. The surface tension of the distilled water, at the temperature of the test, is found in Table I. The capillary tube must be cleaned with a mixture of chromic and sulfuric acids between tests for satisfactory results.

(Continued on page 31)

TABLE 1. — Surface tension of water at various temperatures

Temperature Deg. C	Temperature Deg. F	Surface Tension
5	41	74.9
10	50	74.2
15	59	73.5
20	68	72.8
25	77	72.0
30	86	71.2
35	95	70.4
40	104	69.6
45	113	68.8
50	122	67.9

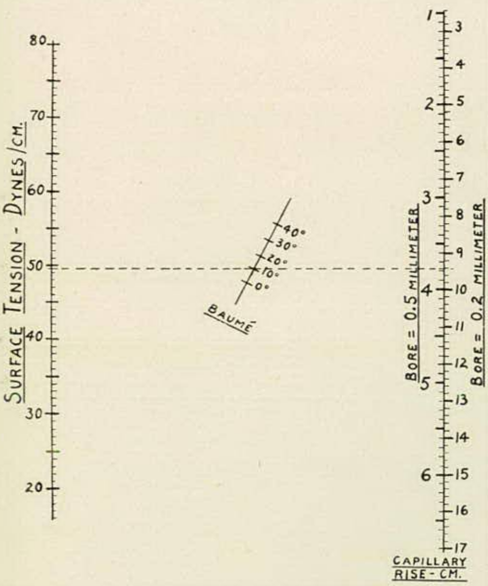


Fig. 3. A nomograph to determine surface tension by a stalagmometer at 77° F.

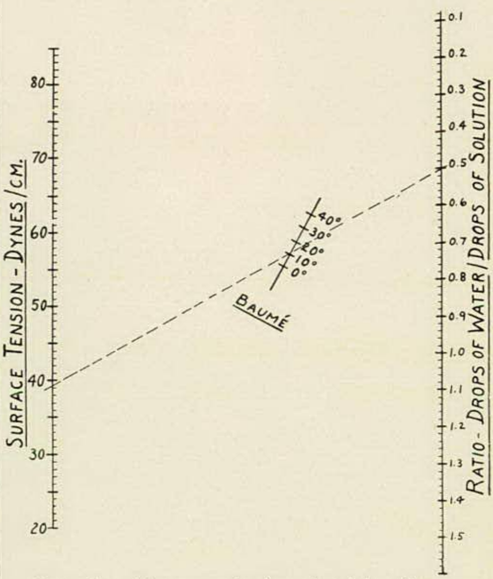


Fig. 4. Nomograph for checking the surface tension by capillary rise.

If an analytical balance is available the bore may be determined by filling with mercury to a measured height and weighing the mercury. The bore may be calculated by substituting in the formula:

$$\text{Bore (in cm.)} = 0.306\sqrt{\frac{\text{Weight of the Mercury in grams}}{\text{Height of the column in centimeters}}}$$

It is only necessary to determine the bore of a capillary once. The nomograph, as shown in Figure 4 has been prepared for solving the capillary rise equation:

$$\text{Surface Tension} = 245.3 \times H \times B \times d.$$

Where, H = Height of column above solution level in beaker, in cm.
d = Specific gravity of the liquid
B = Bore of the capillary in centimeters

(*Continued on page 33*)

For bores of 0.2 and 0.5 mm. the nomograph is used as explained above for the stalagmometer except that no calculation is necessary, the measured height and Baume being used directly.

Example: Capillary rise is 9.4 centimeters
Capillary bore is 0.2 mm.
Density of the solution is 10°Be.

The result will be 49.5 dynes as shown by the dotted line in the nomograph.

When the bore is not exactly 0.2 or 0.5 mm. the nomograph may still be used with the 0.2 mm. scale by multiplying the result by five times the bore in millimeters. Thus if the bore in the above example should be 0.3 mm. the surface tension, as read with the 0.2 mm. scale would be 49.5 dynes. This surface tension is then multiplied by 5 times the bore or $5 \times 0.3 = 1.5$ to give an actual surface tension of $49.5 \times 1.5 = 74.3$ dynes per centimeter.

Note: Both nomographs are based on a temperature of 77°F. (25°C.) but for ordinary purposes between 60°F. and 95°F. the error is negligible.

By NATHANIEL HALL, Consulting Chemical Engineer, G. B. Hogaboom, Jr. & Co., Newark, N. J. Abstracted from *Products Finishing*, June, 1940.

☆ ☆ ☆ ☆ ☆ ☆

Thickness of Deposits from Nickel Plating Solutions Based on Cathode Current Efficiency of 95%

Cathode current density—amperes per square foot

Time in minutes	10	20	30	40	50	60
1	.000008	.000017	.00002	.00003	.00004	.00005
2	.000017	.000034	.00005	.00007	.00008	.00010
3	.000025	.000051	.00007	.00010	.00013	.00015
4	.000034	.000068	.00010	.00013	.00017	.00020
5	.000042	.000085	.00013	.00017	.00021	.00025
6	.000051	.000102	.00015	.00020	.00025	.00030
7	.000059	.000118	.00018	.00024	.00030	.00035
8	.000068	.000135	.00020	.00027	.00034	.00041
9	.000076	.000152	.00023	.00030	.00038	.00046
10	.000085	.000169	.00025	.00034	.00042	.00051
15	.000127	.000254	.00038	.00051	.00063	.00076
20	.000169	.000338	.00051	.00068	.00085	.00101
30	.000254	.000508	.00076	.00101	.00127	.00152
45	.000381	.000762	.00114	.00152	.00190	.00228
60	.000508	.001015	.00152	.00203	.00254	.00305

Contributed by Dr. LOUIS WEISBERG, Consulting Chemist, New York.

Members of the New York Branch, American Electroplaters' Society

Name	Address	Business Connection
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C. de Baun, (Associate)		Egyptian Lacquer Co., 1270 Sixth Ave., New York, N. Y.
Gerald D'Agostino (Active)		Albert's Nickel Plating Works 286 Taaffe Place, Brooklyn, N. Y.
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Theodore Frank (Active)	6309 Bay Parkway, Brooklyn, N. Y.	Foreman plater, G. M. Ketcham Mfg. Corp., 81 Washington St., Brooklyn, N. Y.
Stephen Gables, (Associate)	853 Riverside Drive, New York, N. Y.	Salesman, Egyptian Lacquer Co., 1270 Sixth Ave., New York, N. Y.
Steve Galetti, (Active)	108-62 39th Ave., Corona, N. Y.	Foreman, gold plater, Metro Metal Craft, Inc., 406-426 W. 31st St., New York, N. Y.
Max Gelfman, (Active)	2526 Bronx Park East, Bronx, New York, N. Y.	Electroplater
Sam Goldstein, (Active)	1110 Wyatt St., Bronx, New York, N. Y.	Superior Electroplating Co., 224 Center St., New York, N. Y.
Arthur Grinham, (Active)	Newcastle, New South Wales, Australia	Master electroplater, King & Grinham, Ltd., 87 Gibson St., Newcastle, New South Wales, Australia
Joseph Haas, (Active)	44 Fairfield Ave., S. Norwalk, Conn.	Factory superintendent, The Bassick Co., West Plant, Railroad and Howard Aves., Bridgeport, Conn.
Nathaniel Hall, (Associate)	1702 W. 1st St., Brooklyn, N. Y.	G. B. Hogaboom Jr. & Co., 352 Mulberry St., Newark, N. J.
Seymour Halpern, (Associate)	506 Ft. Washington Ave., New York, N. Y.	Plater-chemist, United Wire Goods Mfg. Co., 1150 Broadway, New York, N. Y.
A. D. Havens, (Active)	103-43 107th St., Richmond Hill, N. Y.	Foreman, metal finishing, Brass Goods Mfg. Co., 345 Eldert St., Brooklyn, N. Y.
Anthony Henry, (Active)	43-26 49th St., Long Island City, N. Y.	Foreman plater, Marcel-Boucher, Ltd., 304 E. 23rd St., New York, N. Y.
George F. Hermann, (Active)	52 Chestnut St., Brooklyn, N. Y.	Foreman, metal finishing, W. L. Maxson Corp., 460 W. 34th St., New York, N. Y.
Louis Holland, (Associate)	489 Broadway, Brooklyn, N. Y.	Sect. and sales manager, J. Holland & Sons, Inc., 274 South 9th St., Brooklyn, N. Y.
John M. Hosdowich, (Associate)	66-20 108th St., Forest Hills, N. Y.	United Chromium, Inc., 51 East 42nd St., New York, N. Y.
Morris Israelson, (Active)	50 Fountain Place, New Rochelle, N. Y.	Foreman plater, Gruber Bros., 72 Spring St., New York, N. Y.
William Jackman, (Active)	80a Jewell St., Brooklyn, N. Y.	Electroplater foreman
Alfred E. Jeanneret, (Active)	Woodside, N. Y.	Jewelry coloring, 60-05 44th Ave., Woodside, N. Y.
Sigmund Katz, (Active)	1906 80th St., Brooklyn, N. Y.	Chemist, Conmar Products Corp., 717 Avenue A, Bayonne, N. J.
Jack Kaye, (Active)	474 Hinsdale Ave., Brooklyn, N. Y.	Foreman plater, C. & S. Casting & Plating Co., 40-17 22nd St., Long Island City, N. Y.
D. W. Kelly, (Active)	1288 Bergen St., Brooklyn, N. Y.	Foreman plater, Liggett & Co., 340 West 4th St., New York, N. Y.
Harvey H. Kelly, (Active)	5151 Magnolia Ave., Los Angeles, Calif.	Foreman, anodic department, Aluminum Co. of America, Los Angeles, Calif.
Walter Klinsevich, (Associate)	212 Avenue B, New York, N. Y.	Chemist, Jacques Kreisler Mfg. Corp., North Bergen, N. J.; Instructor, Institute of Electrochemistry & Metallurgy, New York, N. Y.
F. M. Koeble, (Active)	305 East 161st St., New York, N. Y.	Foreman plater, F. Keil & Son, Melrose Ave. and 163rd St., Bronx, N.Y.
Joseph B. Kushner, (Associate)	320 Lincoln Place, Brooklyn, N. Y.	Metal finishing consultant, Plating Advisory Service, 126 W. 32nd St., New York, N. Y.

Members of the New York Branch, American Electroplaters' Society—Cont'd

Name	Address	Business Connection
Harold M. Lang, (Associate)	1722 West End Ave., New Hyde Park, N. Y.	Sigmund Cohn, 44 Gold St., New York, N. Y.
Jos. Lerner, (Active)	1500 Sterling Place, Brooklyn, N. Y.	Foreman plater, Friedman Silver Co., 1 Wyckoff Ave., Brooklyn, N. Y.
Henry Levine, (Active)	67-54 Burns St., Forest Hills, N. Y.	Foreman plater, Halcolite Co., 68 34th St., Brooklyn, N. Y.
Alexander Leva, (Associate)		Dodge, Inc., 656 Broadway, New York, N. Y.
R. J. Liguori, (Active)	2429 Hubbard St., Brooklyn, N. Y.	Foreman, polishing and plating dept., Bommer Spring Hinge Co., 263 Classon Ave., Brooklyn, N. Y.
F. J. MacStoker, (Active)	25 Princeton St., Garden City, N. Y.	Electroplating-anodizing division, Sperry Gyroscope Co., 70 Washington St., Brooklyn, N. Y.
Martin F. Maher, Jr., (Associate)	39-49 45th St., Long Island City, N. Y.	Chemist, Etched Products Corp., 3901 Queens Blvd., Long Island City, N. Y.
James Martin, (Active)	2035 38th St., Long Island City, N. Y.	Foreman, electroplating-anodizing dept., Brewster Aeronautical Corp., Northern Blvd. at 35th St., Long Island City, N. Y.
John J. Martini (Active)		Presto Electro Plating Co. 22 Cherry St., New York
Matthew McCleave, (Active)	151 Eckford St., Brooklyn, N. Y.	Chromium div., Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn, N. Y.
Harry F. McFall, (Associate)	Edgewater, N. J.	Chemist, technical service division, General Chemical Co., Edgewater, N. J.
I. Mersham, (Active)	1360 48th St., Brooklyn, N. Y.	Plater-proprietor, Globe Silver Co., 540 First Ave., New York, N. Y.
Harvey Miller, (Active)	8454 159th St., Jamaica, N. Y.	Sterling Casket Hdwe. Co., 5851 Grand Ave., Maspeth, N. Y.
Joseph Minges, (Active)	194-29 114th Ave., St. Albans, N. Y.	Plater foreman
Philip Morningstar, (Active)	16 Golder Ave., Jamaica, N. Y.	Superintendent of finishing dept., K. & O. Mfg. Co., 366 Butler St., Brooklyn, N. Y.
A. P. Munning, (Associate)	22 West 15th St., New York, N. Y.	Founder, A. P. Munning & Co.; Chairman of the Board, Hanson-Van Winkle Munning Co.; President, The Matawan Bank, 209 Main St., Matawan, N. J.
Benjamin Nadel, (Active)	936 East 178th St., Bronx, New York, N. Y.	Foreman plater, Savoy Brass Co., Inc., 43-23 35th St., Long Island City, N. Y.
Milton Nadel, (Active)	1522 Beach Ave., Bronx, New York, N. Y.	Foreman plater, Jas. B. Williams & Co., 423 38th St., Brooklyn, N. Y.
A. E. Nicol, (Active)	Sheffield, England	Walker-Hall, Ltd., Sheffield, England
P. H. O'Connell, (Active)	16 Elmwood Ave., S. Norwalk, Conn.	Supervisor, metal finishing, Edwards & Co., Inc., Norwalk, Conn.
Stephen Olphie, (Active)	457 Chauncey St., Brooklyn, N. Y.	Foreman plater, J. Sklar Mfg. Co., 38-04 Woodside Ave., Woodside, N. Y.
Jay P. Orben, (Associate)		J. P. Orben Co., Polishing and plating supplies, 81 Walker St., New York, N. Y.
Barnet D. Ostrow, (Associate)	265 Neptune Ave., Brooklyn, N. Y.	Chemist, Parker-Kalon Corp., 200 Varick St., New York, N. Y.
Dr. L. C. Pan, (Honorary)		Chemist, metallurgist, Chinese National Government, Canton, China
Michael Parente, (Active)	133-28 85th St., Ozone Park, N. Y.	Plater foreman, McClelland Barclay Art Prod., 124 South St., Newark, N. J.

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Name	Address	Business Connection
Albert M. Pflomm, (Active)	3273 Hull Ave., Bronx, New York, N. Y.	Finishing Foreman, Hammarlund Mfg. Co., Inc., 424 West 33rd St., New York, N. Y.
Ben Popper, (Associate)	New York	Egyptian Lacquer Co., 1270 Sixth Ave., New York, N. Y.
K. T. Potthoff, (Associate)	32 Stockton St., Brooklyn, N. Y.	Treasurer, U. S. Galvanizing & Plating Equipment Corp., 27-41 Heyward St., Brooklyn, N. Y.
Alfred Pritchard, (Active)	162 Birchwood Drive, Belleville, N. J.	Foreman plater, Newark Metal Goods Mfg. Co., 579 S. 11th St., Newark, N. J.
Charles H. Proctor, (Honorary)	Twin Palms, 309 Vine Ave., Clearwater, Florida	President, The Proctor Chemical Co., Clearwater, Fla.
James Puritan, (Active)	38 S. Fifth Ave., Highland Park, N. J.	Foreman, plating and polishing, Consolidated Fruit Jar Co., New Brunswick, N. J.
George M. Rahner, (Active)	7046 66th Place, Glendale, N. Y.	Foreman plater, Peerless Silver Co., 500 Driggs Ave., Brooklyn, N. Y.
Mariano Ranno, (Active)	3433 Edison Ave., Bronx, New York, N. Y.	Foreman, plating operations, Imperial Plating Co., 360 Furman St., Brooklyn, N. Y.
Philip Ranno, (Active)	823 East 234th St., Bronx, New York, N. Y.	Superintendent, Imperial Plating Co., 360 Furman St., Brooklyn, N. Y.
Louis Reed, (Associate)	1324 Intervale Ave., Bronx, New York, N.Y.	Chromium division, Sanitary Dash, Inc., 11th St. and 44th Road, Long Island City, N. Y.
Edwin C. Rinker, (Associate)	20 Sunset Terrace, Tenafly, N. J.	Research and sales, Oakite Products, Inc., 22 Thames St., New York, N. Y.
John Rolff, (Active)	117-30 168th St., Jamaica, N. Y.	Supervisor, plating and finishing, Scovill Mfg. Co., Schrader Div., 470 Vanderbilt Ave., Brooklyn, N. Y.
Irving Rosenfeld, (Active)	115 Avenue N., Brooklyn, N. Y.	Electroplater, foreman.
J. Scapollite, (Active)	264 East 199th St., New York, N. Y.	Foreman of plating department, Radiant Lighting Fixture Co., 95 Morton St., New York, N. Y.
Chas. E. Schlott, (Associate)		Egyptian Lacquer Co., 1270 Sixth Ave., New York, N. Y.
William J. Schneider, (Associate)	1901 Avenue P, (Apt. 5B), Brooklyn, N. Y.	Technical and sales dept., Electroplating Division, E. I. du Pont de Nemours & Co., 350 Fifth Ave., New York, N. Y.
Elias Schor, (Active)	950 Ave. St. John, New York, N. Y.	Night foreman, electrolytic engraving dept., Neo Gravure Printing Co., 601 W. 26th St., New York, N. Y.
George Schore, (Active)	950 Ave. St. John, New York, N. Y.	Foreman, plating and finishing depts., Argo Lamp Co., 418 Cherry St., Philadelphia, Pa.
K. W. Schwartz, (Associate)		Vice-president, United Chromium, Inc., 51 East 42nd St., New York, N. Y.
W. R. Shanks, (Active)	157-20 10th Ave., Beechhurst, N. Y.	Metal finishing division, Ford Instrument Co., Inc., Long Island City, N. Y.
Harry Simon, (Active)	54 East 182nd St., New York, N. Y.	Foreman plater
Joseph Simon, (Active)	1314 Ocean Parkway, Brooklyn, N. Y.	Chemist, plater, International Appliance Corp., Brooklyn, N. Y.
Sol Steckman, (Active)	2044 Nostrand Ave., Brooklyn, N. Y.	Plating foreman, Conmar Products Corp., 717 Avenue A, Bayonne, N. J.
John E. Sterling, (Active)	2429 28th St., Astoria, N. Y.	Past President, Amer. Electroplaters Soc.
William Strein, (Active)	6404 Metropolitan Ave., Brooklyn, N. Y.	Foreman plater, John Hassall, Inc., 402 Oakland St., Brooklyn, N. Y.

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Name	Address	Business Connection
J. A. Stremel, (Active)	525 85th St., Brooklyn, N. Y.	Finishing foreman, Chas. Schaefer & Son, 568 Broadway, New York, N. Y.
T. A. Trumbour, (Honorary)	57 Buena Vista Ave., Hawthorne, N. J.	Business manager, "Metal Finishing", 116 John St., New York, N. Y.
Ernest Turtell, (Active)	3109 Ft. Hamilton Ave., Brooklyn, N. Y.	Foreman electroplater, Fred Gretsch, 60 Broadway, Brooklyn, N. Y.
William E. Vella (Active)		Egyptian Lacquer Mfg. Co., 1270 6th Ave., New York, N. Y.
William Voss, (Associate)	90 Goldenrod Ave., Franklin Square, N. Y.	Frederick Gumm Chemical Co., 295 Lafayette St., New York City, 540 Forest St., Kearny, N. J.
John J. Walsh, (Active)		Triboro Electroplating Co., 131-46 40th Road, Flushing, N. Y.
Max Weiss, (Associate)	2109 85th St., Brooklyn, N. Y.	Supervisor, plating and finishing, Cohen Epner Co., 142 W. 14th St., New York, N. Y.
George J. Wunsch, (Active)	144-35 15th Ave., Whitestone, N. Y.	Plater foreman, Fairchild Aviation Corp., 88-06 Van Wyck Blvd., Jamaica, N. Y.
C. B. F. Young, (Associate)	Box 292, Flushing, N. Y.	Consultant and instructor
Samuel Zimmerman, (Active)	436 E. 55th St., Brooklyn, N. Y.	Tri-Pact Plating Co., 20 Eldridge St., New York, N. Y.

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