
CHAPTER TWO

TESTING CAN BE TROUBLESOME

After World War II, testing commodities for conformance with specifications in Government purchases, and testing services for regulatory agencies were only a small part of the Bureau's activities. Thus, in 1952, the total expenditures for this type of work were about 1 percent of the total budget. Testing for agencies with regulatory responsibilities, principally the Federal Trade Commission (FTC, concerned with misleading advertising claims), and the Post Office Department (POD, concerned with mail fraud), was indeed a small amount of work, amounting to only a twentieth of 1 percent, or \$25 000.¹ Nevertheless, this monetarily small effort contained within it the seeds of controversy and embarrassment. If the Bureau were publicly to identify a proprietary product that did not meet specifications or advertised claims, it could be accused of unfairly treating the product, and its results could be subject to questioning. If it gave public approval of a product, competing manufacturers could complain of unfair treatment. And if the Bureau condemned a class of materials without naming specific manufacturers, the latter could—and some did—claim that their product was different, hence the Bureau's results did not apply to it.

In a number of cases in the Bureau's history it was led into controversy by this testing activity and subsequent publication of the results. The best-known incidents were the testing of Aquella, a waterproofing paint, and Battery AD-X2, a battery additive that, under some circumstances, allegedly revived old, "dead," lead-acid batteries. The Aquella incident was relatively minor, causing not a great deal more than embarrassment for the Bureau. The Battery AD-X2 controversy, on the other hand, was serious indeed. It caused the firing of the Bureau's director, followed eventually by full reinstatement; prompted the investigation of the Bureau by two high-level committees and brought about dramatic changes in its programs; provoked a furor in the whole scientific community and led a large number of the Bureau staff to threaten resignation; resulted in six days of hearings before a Senate select committee; made the Bureau and its director front-page news for months; brought about the resignation of an assistant secretary of commerce; and (in part) caused the transfer of 2000 persons from the Bureau to newly formed military laboratories.

The stories of the two incidents are instructive in illustrating the kind of problems that can—and did—occur as a result of commodity testing. The common element that connects the two cases is the publication of the results in a form available to the general public.

¹ Senate Select Committee on Small Business. *Battery AD-X2: Hearings Before the Select Committee on Small Business, United States Senate, Eighty-third Congress, first session, on Investigation of Battery Additive AD-X2, March 31, June 22, 23, 24, 25, and 26, 1953*: 212. Hereafter this document will be referred to as "AD-X2 Hearings."

POLICIES ON COMMODITY TESTING AND PUBLICATIONS

The Bureau's policy on this testing and on the resulting publications is of crucial importance, and is made clear by testimony before the Senate Select Committee on Small Business in 1953, by Dr. Allen V. Astin, Bureau director from 1951 to 1969:

Frequently, in the course of its testing work, the Bureau accumulates general information on classes of materials and products that is of interest and importance to the public. In many of these cases, publications are prepared for general distribution in which references to specific proprietary products is avoided. Occasionally there are publications, in which brand name products are identified, but this is done with the consent and cooperation of the manufacturers involved. A notable example is in the publication of data on the acoustical properties of materials. These data are determined at the joint request of building and manufacturing groups, and the results are of appreciable value to architects and construction engineers in their design problems. But even in this case no attempt is made to provide an overall evaluation or an approval of a particular item. Also in such cases the Bureau does not permit the use of its name by manufacturers for advertising or promotion purposes.²

The Bureau's information was published in any of a number of publication series, but always in the form of booklets or pamphlets which could be purchased from the Government Printing Office for a few cents each.³ So extensive were these publications that in 1940 a special Letter Circular, LC 586, "List of Publications of Interest to the General Public," was published. In 1942 this was superseded by LC 696 which listed approximately 1200 publications, not all of them based on Bureau testing.⁴ A tabulation of a few of the titles gives an indication of the topics covered:

² A. V. Astin testimony, AD-X2 Hearings: 213. The publications in which proprietary names were used were a separate series, the Building Materials and Structures Reports, published from 1938 to 1959. These were part of a program begun by the Bureau in 1937 to provide technical information to all parties in the building industry on building construction materials for use in low-cost housing. This work was decidedly different from commodity testing. First, the materials for test did not come from another agency, but were voluntarily submitted by the manufacturer. Second, this was not testing to see if a material complied with a specification. In fact, no specifications existed, and part of the effort was to obtain enough information to write a specification. Until 1947, each publication contained the statement, "The National Bureau of Standards is a fact-finding organization; it does not 'approve' any particular material or method of construction. The technical findings in this series of reports are to be construed accordingly."

³ The various publication series of the Bureau are described in Appendix H.

⁴ Along with about 800 Federal Specifications (most of them for foodstuffs), LC 696 listed 45 Commercial Standards and 60 Simplified Practice Recommendations. Not all of these publications were based solely on Bureau work, but there were about 300 that were. Thus LC 696 cataloged 19 Circulars (C); 41 Research Papers (RP); 20 Miscellaneous Publications (M); 4 publications in the Building and Housing Series (BH); 3 Handbooks (H); 85 Letter Circulars (LC); 61 publications in the Technical Information on Building Materials Series (TIBM); and 89 in the Building Materials and Structures Series (BMS).

U. S. DEPARTMENT OF COMMERCE
HARRY L. HOPKINS, Secretary
NATIONAL BUREAU OF STANDARDS
LYMAN J. BRIGGS, Director

CIRCULAR OF THE NATIONAL BUREAU OF STANDARDS 644
(Supersedes Circular C283)

WASHING, CLEANING, AND POLISHING MATERIALS

By F. W. Smither

ISS

Standard & Design

U. S. DEPARTMENT OF COMMERCE
R. F. LAMONT, Secretary
BUREAU OF STANDARDS
GEORGE K. BURGESS, Director

CIRCULAR OF THE NATIONAL BUREAU OF STANDARDS, No. 397
(Supersedes Circular No. 78)

SAFETY FOR THE HOUSEHOLD

UNITED STATES DEPARTMENT OF COMMERCE • Charles Sawyer, Secretary
NATIONAL BUREAU OF STANDARDS • G. K. Burgess, Director

Battery Additives

GOVERNMENT
W.A.

For sale by the Superintendent of Documents

FOR SALE BY THE

Nat

For sale by the

Automotive Antifreezes

by Donald B. Brooks and Ronald E. Streets



National Bureau of Standards Circular 474
Issued November 10, 1948

UNITED STATES GOVERNMENT PRINTING OFFICE WASHINGTON : 1948
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.
Price 15 cents

NBS was not a regulatory agency. The Bureau never tested proprietary products unless requested to do so by another government agency with regulatory powers, such as the Federal Trade Commission or the Post Office Department, or by an agency interested in purchasing such products. Occasionally NBS published information that it had obtained on a class of products when that data was thought useful to the general public. References to specific brand names were avoided except with prior agreement by the interested parties.

- *Safety for the Household*, C 397
- *Washing, Cleaning, and Polishing Materials*, C 424
- *Automotive Anti-Freezes*, C 474⁵
- *Accelerated Weathering Tests of Mineral-Surfaced Asphalt Shingles*, RP 1002
- *Charts for Testing Lens Resolution*, M 166
- *Care and Repair of the Home*, BH 15
- *Sun Lamps, Health Lamps; Carbon and Mercury Lamps*, LC 631
- *Automobile Engine Lubricating Oils*, LC 613
- *Painting Steam and Hot Water Radiators*, LC 445
- *Corrosion of Metals Used in Home Construction*, TIBM 1.

Practically oriented and simply written, some of these publications were very popular indeed. *How to Own Your Own Home*, BH 4, issued in 1923, sold 100 000 copies in the first week of its publication, and 300 000 by the end of the year. It was serialized in several newspapers and magazines.⁶ *Care and Repair of the Home*, BH 15, first issued in 1931, sold more than 500 000 copies by 1940. But it raised a furor in the building-repair trades that was not lessened by the Bureau's aggressive advertising campaign and a Doubleday Doran hard-cover edition.⁷

While these booklets contained information of value to the Nation, there were always potential problems for the Bureau inherent in their publication. The case of a water-repellant paint, "Aquilla," illustrates some of the problems that could arise.⁸

THE AQUILLA INCIDENT

During May and June 1942, Leandro W. Tomarkin, a Swiss scientist, visited the Bureau several times. He told then Bureau Director Lyman J. Briggs about a waterproofing paint developed by a French paint manufacturer, Rene Hagenauer. Both

⁵ This circular, issued in 1948, so appealed to Director Condon that he wrote to Secretary of Commerce Sawyer requesting permission to send a copy to each member of the Cabinet. Whether such permission was granted and copies sent is not known. (NARA; RG 167; Records of the Director; Box 6; Folder D/IG)

⁶ MFP, 251.

⁷ Ibid., 252-253.

⁸ Memorandum, from Douglas E. Parsons to Bureau Director Allen V. Astin, "The Aquilla Case," April 15, 1953. (NARA; RG 167; Astin file; Box 2; Folder Controversies). This memorandum and associated documents are the main sources for the account given here. At the time the memorandum was written, Parsons was chief of the Building Technology Division. From 1930 to 1945 he was chief of the Masonry Construction Section in which the work to be described was performed. Another perspective is given by Cochrane in MFP, 482-483, 487.

Tomarkin and Hagenauer were immigrants living in New York.⁹ The paint had presumably been used to waterproof structures in the Maginot line. Tomarkin claimed no financial interest in the product and asked Briggs to test it. Concerned with the "need for a low-cost waterproofing [material] for the hastily built wartime structures, Briggs agreed that the NBS would examine a sample of the material which Tomarkin offered to supply."¹⁰

The policy on carrying out tests for private individuals, as later enunciated by Allen V. Astin, was:

in the commodity-testing activity similar services are frequently available in private testing laboratories; therefore, the Bureau's work in this area is confined to serving other Government agencies in connection with their purchasing or regulatory responsibilities. Occasionally a testing problem arises where the Bureau's facilities are unique or where its services are desired for referee purposes, and under such circumstances a commodity test might be performed for the general public.¹¹

In agreeing to test Aquella, the Bureau was not conducting a referee test. Since the facilities for carrying out the test were rather routine and available from any well-equipped testing laboratory, so it can be surmised that Briggs was spurred by wartime pressures into carrying out a test for a private individual. As will be discussed later, however, there is some evidence that Briggs may also have had requests from other agencies for this testing.

A small sample of the material was provided by Tomarkin and Hagenauer, and a chemical analysis was performed on it. This "indicated that it was a cement-water paint similar to some products made in the USA."¹²

With larger samples of Aquella provided later, wall permeability tests were carried out on two brick and two concrete block walls during the summer of 1942. Tomarkin and Hagenauer helped in the tests. In response to a letter from Tomarkin of September 2, 1942, on September 7 the Bureau wrote in reply, "Pending the issuing of a complete report . . . the performance of the wall was rated 'excellent.' Please be particular to bear in mind that this information is confidential and is not to be used for advertising, publication or sales promotion."¹³

On December 8, a report (hereafter referred to as the "early report") on the performance of the paint was written.¹⁴ In it, Tomarkin was now identified as director,

⁹ MFP, p. 482.

¹⁰ Parsons, "Aquella Case."

¹¹ A. V. Astin testimony, AD-X2 Hearings: 212-213.

¹² Parsons, "Aquella Case."

¹³ Letter, NBS to L. W. Tomarkin, September 7, 1942. (NARA; RG 167; Astin file; Box 2; Folder Controversies)

¹⁴ *Report of Water Permeability Tests on Coatings of "Aquella" Paint Applied to Masonry Walls*, submitted by L. W. Tomarkin, Director, Center for Applied Scientific Research and Industrial Technology, New York, N.Y. (NARA; RG 167; Astin file; Box 2; Folder Controversies)

Center for Applied Scientific Research and Industrial Technology of New York City, and Hagenauer as the president of Special Paint Cie, which had manufactured and supplied the paint. In the report, the two walls treated on the exposed surface were rated as "excellent," and the two treated on the unexposed surfaces rated as "good" after a second coat. Despite the fact that such tests were normally carried over several years of exposure, and these results were only for tests conducted in July and August 1942, the report is not labelled as preliminary, nor the results otherwise qualified. It does, however, contain the notice, "The contents of this report are confidential and are not to be used for advertising, publication or sales promotion." Copies of the report "were sent to a few representatives of other Government agencies, and one was given to Dr. Tomarkin."¹⁵

Apparently influenced by the report, the Federal Trade Commission (FTC) asked for later results. Such a report, which included results from tests made in May 1943 (still representing only eight months of exposure), was issued on June 4, 1943. This will be referred to as the "later" or "final" report. There was a decided change in the results. Three of the four walls were now rated "good," and one was rated "poor." No longer were two walls rated "excellent." It is not known if this later report was sent to Tomarkin, but the bulk of the record indicates that it was not. Indeed, if the FTC had contracted for the extended work, it would have been against Bureau policy to send the report to anyone but the contracting agency. The Bureau's position was that the report became a property of the requesting agency, and any distribution was up to that agency.

Six months later things began to get more complicated. Briggs received a letter dated January 7, 1944, from Harris H. Murdock, Chairman of the Board of Standards and Appeals (BSA) of New York City. Murdock wrote that he had seen a copy of the December 8, 1942, report, and was in accord with the paragraph warning of its confidentiality and against the use of the results for advertising, publication, and sales promotion. He asked, however, if the report could be referred to or quoted from "when we have occasion to approve for use . . . a material . . . on which you have reported and this Board's action might be based . . . on your findings."¹⁶ Briggs immediately wrote back that "it would not be in the public interest for you to publish quotations from the report. . . ." He pointed out that there was no assurance that the product was the same as that which the Bureau had tested. Nevertheless he had "no objections to the use of our report in memoranda or reports from employees or officials of the City of New York addressed solely to other officials."¹⁷ Briggs' letter says nothing about the later report.

The early report was to go much further. Indeed, on September 23, 1943, almost four months before the Murdock letter, but three months after the Bureau's later report, the Modern Waterproofing Paint Company, now manufacturing Aquella, had applied to

¹⁵ Parsons, "Aquella Case."

¹⁶ Letter, H. H. Murdock to L. J. Briggs, January 7, 1944. (NARA; RG 167; Astin file; Box 2; Folder Controversies)

¹⁷ Letter, L. J. Briggs to H. H. Murdock, January 12, 1944. (NARA; RG 167; Astin file; Box 2; Folder Controversies)

the BSA to have its product approved. Tomarkin appeared before the Board for the applicant. On June 6, 1944, in the *Bulletin of the Board of Standards and Appeals*, an account of the petition was given, the December 8 report was published in full, and the use of Aquella was approved. No account of the Bureau's later tests was given. The Bureau's early results on a proprietary product were available to whomever would seek them, but the full testing results were not.

In due course Briggs learned of the Bulletin announcement and received a copy of it from Murdock on May 31, 1945. Briggs wrote back, with copies to the paint manufacturers, pointing out the results of the later tests and the consequent misleading nature of the Bulletin account.¹⁸ He also wrote about the origin of the tests. "The tests of 'Aquella' were made to obtain technical information for Government agencies which had expressed an interest in the product, and for certain other special reasons." Briggs did not say that other agencies had commissioned the tests, and he does not say what the "other special reasons" were. He wrote further what was really the crux of the matter:

With some justification, manufacturers of products which compete with "Aquella" might claim that the publication of excerpts of our report on "Aquella" is not fair to them unless similar reports on their products are issued and published. Obviously, this would be very difficult and . . . would be contrary to the policy of this Bureau.

Nothing further happened on this front.

On the legal front, however, things did happen. The FTC issued a complaint against the Modern Waterproofing Paint Company, specifically citing Tomarkin along with four other individuals.¹⁹ The basis of the complaint was that the:

respondents represent . . . that their said paint product is an effective waterproofing material or compound. . . . The foregoing statements and representations made by the respondents in connection with the promotion of sale and sale of their said product are false, misleading and deceptive.

This action by the FTC continued until June 1, 1953, when the respondents were ordered to cease and desist from various representations of their product.

But before this happened, there was another episode in the Aquella affair. The December 15, 1945, issue of *Forbes* contained an article by Kurt Steel entitled "Dry Cellars," and the January 1946 issue of *Reader's Digest* (which appeared on the newsstands before the *Forbes* issue) contained an abstract of the *Forbes* article by the same

¹⁸ Letter, L. J. Briggs to H. H. Murdock, June 12, 1945. (NARA; RG 167; Astin file; Box 2; Folder Controversies)

¹⁹ Federal Trade Commission Complaint, Docket No. 5364, "In the Matter of Ira A. Campbell, Leandro W. Tomarkin, Wanda Tomarkin, Zella Fay Campbell, and Zella Clarke, individually and trading as Modern Waterproofing Paint Company," August 10, 1945, paragraphs 4, 5. (NARA; RG 167; Astin file; Box 2; Folder Controversies)

author entitled, "Water, Stay Away From My Wall." Both articles were highly laudatory of Aquella, and "contained misstatements of fact about the Bureau's tests and data."²⁰ Almost immediately, on December 29, 1945, Edward U. Condon, who had succeeded Briggs as director in November, wrote a letter to *Forbes*, with a copy to *Reader's Digest*, pointing out the inaccuracies in the published article, and containing the statement, "The coatings of Aquella . . . were found to be no more effective as waterproofings than coatings of other products. . . . [T]ests . . . for eight or more months indicated that the Aquella coatings had become less effective . . . than were some of the laboratory-mixed cement-paint coatings. . . ." He promised to send copies of the letter to "those who request information about Aquella." And more than 20 000 did so. They were sent copies of Condon's letter. This did not sit well with some people. Aquella was a hot item, and many persons were seeking distributorships. Thus, Georgia Governor Ellis Arnall, speaking on behalf of prospective distributors in his State, contacted Secretary of Commerce Henry A. Wallace about the problem.²¹ Wallace wrote to the manufacturers of Aquella recalling and retracting the Condon letter. The Bureau stopped sending it out in response to requests about Aquella, and instead sent a summary of the experimental results.²² Except for sending some of its staff as expert witnesses in the continuing FTC Hearings, the Bureau's effort in this incident ended.

The Aquella incident was not a world-shaking event. The manufacturers of Aquella were ordered to "cease and desist" in their advertising claims, but the Bureau suffered no lasting harm from the experience. Certainly it suffered some embarrassment, particularly in having a letter of its director retracted by the secretary of commerce, but this was not a lasting injury. There are, however, some lessons to be learned from the affair. The Bureau's technical results were never questioned. The results of its work, in both reports, were accepted, but this illustrates that a great deal of trouble can be caused even if the technical work is correct. And the incident illustrated the great power of Bureau publications. One of its reports—whether misused or not—helped gain a manufacturer approval of its product for use by the New York City government, and caused thousands to write to the Bureau for information.

But the most important lesson was the scrupulous care the Bureau needed to take with the results of testing of proprietary products. While the record is not clear on all aspects of the history of the incident, it well illustrated the problems inherent in carrying out tests for a manufacturer who is inevitably not a disinterested party. Such testing was against long-standing Bureau policy. While there is some evidence in

²⁰ Parsons, "Aquella Case."

²¹ Letter, E. U. Condon to Forbes Publishing Co. and *Reader's Digest*, December 29, 1945. (NARA; RG 167; Astin file; Box 2; Folder Controversies); MFP, 483.

²² Letter, H. A. Wallace to Milton F. Schreyer, President of Prima Products, Inc. (now the manufacturers of Aquella), June 3, 1946. The letter contains the statement, "The Bureau stands upon the complete report of water permeability tests on coatings of 'Aquella' paint as applied to Masonry walls dated December 8, 1942, on file in the office of the National Bureau of Standards." (NARA; RG 167; Astin file; Box 2; Folder Controversies); Summary of "Water-Permeability Tests of Coatings of 'Aquella' Applied to Masonry Walls." August 9, 1946. (NARA; RG 167; Astin file; Box 2; Folder Controversies)

Briggs' June 12, 1945, letter to Murdock that there was some interest from unspecified other Government agencies, it is not clear that the tests were done at their request. If, in fact, another agency had contracted for the work, the Bureau would have sent its report only to that agency. It thus appears that the main instigator of the work was Tomarkin, and not another Government agency. He provided the material, assisted in the application along with Hagenauer, and received a copy of the report. Very likely only wartime necessity caused Briggs to go against the Bureau's policy.

The incident also illustrates well the meticulous handling required of reports that name proprietary products. Certainly the fact that the 1942 report was not prominently labelled "preliminary" can only be described as an oversight. And, in this day of the Freedom of Information Act, the injunction against publication of the results, or their use for sales promotion, sounds ingenuous. But perhaps the most serious problem was the handling of the final report. It is not clear that Tomarkin was ever sent a copy, or that he was notified that the results of the earlier report were superseded. Thus, Tomarkin and his associates could have considered the first report as the final word and used it in a low-key sales promotion before the BSA. This led to the publication of the early report as gospel, and to the two feature articles, however inspired. In due course—and certainly after the June 12, 1945, letter from Briggs to Murdock—the manufacturers learned of the Bureau's final report, but apparently continued their advertising claims until the "cease and desist" order. Had the Bureau made sure that the manufacturers, and the BSA, received a copy of the final report, some of the events in the Aquella affair might have been precluded.

THE BATTERY ADDITIVE INCIDENT

While the Aquella affair caused the Bureau some embarrassment, it left no permanent scars, nor caused any changes in its programs. This was not the case with the similar, but far more serious, affair caused by the testing of a material—a "battery additive" marketed under the name "Battery AD-X2"—which, when added to a lead-acid battery, allegedly improved its performance and, under some circumstances, could presumably revive a "dead" battery. This incident was to cause major changes in the Bureau's programs. Also, unlike the Aquella affair, in the battery additive incident the Bureau's technical results were severely questioned. At the heart of the matter was the fact that AD-X2 had many satisfied users, while the Bureau—mostly on the basis of its own laboratory results—steadfastly maintained that it was "not effective." The question was not that the product was harmful; had it been, there would have been no incident, for it would not have lasted on the market. Rather the question was, "Did the product do anything that could not have been obtained without using it?" The Bureau was caught in the uncomfortable position of having to prove a negative, for if a set of experiments showed the product to be ineffective, it could always be argued—and was—that a different set would show otherwise.

The Battery AD-X2 affair began in 1948 and reached a climax in 1953, but the story properly begins with the Bureau's activities in battery research and testing.



Jess M. Ritchie's photograph appears to give credibility to the claims below it. The Bureau's analysis of AD-X2 showed that the material was primarily a simple mixture of sodium and magnesium sulfates with a number of trace elements usually found in battery additives. Results of tests showed that the effect of AD-X2 in a battery electrolyte was no different from that of other mixtures of sodium and magnesium sulfates and that none had any measurable effect on the performance of a lead-acid storage battery.

BATTERIES AND BATTERY ADDITIVES

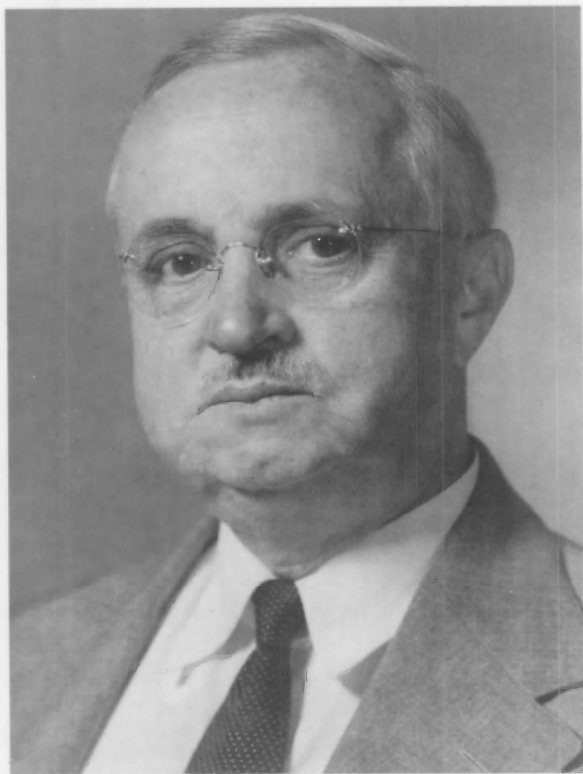
The Bureau, driven by the need for a stable and reproducible electrolytic cell as a standard for the volt, began research in electrochemistry in its earliest days. It did not, however, begin research on batteries until 1917, when it was driven to it by wartime necessity. The Annual Report for Fiscal Year 1918 announced:

The need of the development of specifications and methods of testing for electric batteries has long been recognized; but facilities have not been available to undertake this work. The needs of the military departments have recently become so urgent that the study of batteries has been undertaken.²³

These studies were to continue for more than fifty years. Beginning with dry cells, the work rapidly expanded to include all types of batteries: automotive type batteries, aircraft batteries, truck batteries, railroad batteries, dry cells, lead-acid storage batteries, alkaline batteries, and reserve or "delayed-action" batteries. There was practical work on testing methods and a great deal of testing for other agencies, basic research on electrode reactions, the effect of impurities in the electrolyte and in the battery plates, and the study of various materials. At the request of the military, a small-scale battery-manufacturing plant was set up to make lead-acid battery plates for experimental purposes. There was hardly a phase of battery science and technology not known to the Bureau.

²³ Annual Report, 1918: 48.

Carried out in the Electrochemistry Section of the Electricity Division, the continuity of the battery work was rivaled only by the work on basic measurement standards. From 1918, when battery research began at the Bureau, until his retirement in 1950, George W. Vinal was chief of this section. He came to the Bureau in 1908, and had a stay of forty-three years, all of them devoted to various aspects of electrochemistry and batteries. In 1924 he published the definitive text, *Storage Batteries*, which went through four editions, the last in 1955.²⁴ Upon his retirement, he was succeeded by Walter J. Hamer, another eminent electrochemist. After receiving his Ph.D. in 1932 from Yale University for work on electrolytes and the ionization of water, Hamer spent three years doing post-doctoral work—two years working on the thermodynamics and physical chemistry of electrolytes and a third on non-electrolytes and electrolytes, including those used in lead-acid batteries. He joined the Bureau in 1935. By the time he succeeded Vinal, he was widely recognized for his investigations of electrolytes, storage batteries, dry cells, and the electrometric determination of acidity. He was to remain chief of the Electrochemistry Section until his retirement in 1970, at which time the section was disbanded. Thus, for fifty-two years all the work on batteries was under the direction of two distinguished scientists. Both were to play central roles in the AD-X2 affair.



George W. Vinal served as the chief of the Electrochemistry Section from its formation in 1918 until his retirement in 1950. He was internationally recognized for his research in the field of electrochemistry, particularly for his work in the development and perfection of the silver voltmeter and the standard cell which served as standards for the international ampere and volt.

²⁴ G. W. Vinal, *Storage Batteries* (New York: John Wiley and Sons, 1924).



Walter J. Hamer was chief of the Electrochemistry Section from 1950 to 1970 where his main responsibility was the maintenance of the Nation's primary standard of electromotive force. He was recognized for his extensive research in standard cells, primary and secondary batteries, and electrolytic solutions, and later in work relating to the National Standard Reference Data System.

Not only did the Bureau test batteries for other agencies, but it also tested battery additives. Introduced as early as 1915, these were proprietary chemical preparations of assorted kinds reputed to have beneficial effects on various aspects of battery performance. Some were solids to be added to the battery electrolyte, and some were liquids (usually sulfuric acid solutions) to replace the electrolyte. Testing of these products began in 1919 and continued until 1957,²⁵ although the Bureau continued to provide expert witnesses until 1971. Never was an additive found that had a beneficial effect. Many of them were simple mixtures of magnesium and sodium sulfates (Epsom and Glauber's salts, respectively), and were uniformly found to be without merit, but not necessarily harmful.²⁶ Indeed, the ineffectiveness of these compounds had been known since 1902.²⁷ Others contained iron salts or halogen compounds and were actually harmful.

²⁵ "Table: Lists of Tests of Battery Additives." This table gives a tabulation of all the battery additives tested by the Bureau from April 1919 to March 1952. (NARA; RG 167; Astin file; Box 10; Folder Pioneers & Ritchie)

²⁶ Strictly speaking, Epsom and Glauber's salts contain water of crystallization, the formulas being $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ and $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$, respectively. Heating can partially or totally drive off the water. If all the water is driven off, the anhydrous salts are obtained. When dissolved in water or in storage battery electrolyte, the solutions obtained from any of these states of hydration are identical, provided only that allowance is made for the weight of water to obtain specified concentrations.

²⁷ Vinal, *Storage Batteries*, 1955 ed.: 157.

It is important to note that one of the very first tests conducted was for the Associated Advertising Clubs of the World, an organization concerned with truth in advertising. Associated with this organization were Better Business Bureaus (BBBs). These business-supported agencies were organized to protect responsible business and consumer interests, and published periodicals on items of interest to the consumer. Of concern to the BBBs was truth in advertising, and they were to play a central role in the battery additive incident.

As early as 1925, the Bureau published an article in its *Technical News Bulletin* entitled "Solutions Do Not Charge Storage Batteries." The article states:

Comparison was made between batteries containing these solutions and similar batteries containing electrolyte of sulphuric acid of equivalent strength. No essential differences were shown in the charging, the voltage, the efficiency, or the temperature.²⁸

Work continued, and by 1931 the Bureau had tested more than a dozen additives, the majority of them for the FTC and the POD. More than 100 had been brought to its attention. Because of the large number of requests for information on these additives, in that year it issued Letter Circular (LC) 302, *Battery Compounds and Solutions*. This document was sent in response to those requests. Referring to the 1925 publication, the letter circular states, "The later tests confirm the Bureau's previous conclusions that these materials do not charge storage batteries nor do they materially improve the performance of the batteries." The last phrase clearly shows how the Bureau was in the position of having to prove a negative.

In effect, LC 302 condemned all battery additives, but never named a proprietary product. In 1940, the National Better Business Bureau, which had been condemning battery additives since the 1920s, used the Letter Circular to prepare its own publication, *Facts About Battery Dopes*, further—and soundly—condemning battery additives. Using section titles such as "Useless or harmful—say manufacturers"; "'Debunking' claims for battery 'dopes'"; "No 'dopes' for Uncle Sam"; "Drugstore magic"; and "Trick tests and testimonials," it quotes a manufacturer:

To date there has been nothing found which can be added to the electrolyte of a storage battery which will facilitate charging or increase the life of a storage battery. . . . battery dope[s] . . . are either harmful to the life of a storage battery or have no material effect either on the life or on the charge of a battery.²⁹

The document also quotes Lyman J. Briggs, then the director of the Bureau (which it calls "The highest impartial scientific authority in the United States on storage batteries") as follows:

²⁸ "Solutions Do Not Charge Storage Batteries," *Technical News Bulletin*, No. 94, (February 10, 1925): 1-2.

²⁹ National Better Business Bureau, *Facts About Battery Dopes*. (AD-X2 Hearings: 41)

It is, of course, possible that some material may eventually be found which would relieve the difficulties arising from abnormal operation of storage batteries, but none of the exploited materials which have been tested here have had any such merits. . . .

. . . Carefully controlled tests are necessary in order to determine these points definitely and *none of these materials which have been tested here have produced any beneficial effect when added to the regular electrolyte. Some are definitely harmful.*

The publication was a thorough condemnation of battery additives, and much of it was based on the Bureau's work.

A SHORT TECHNICAL NOTE

Unlike the Aquella incident, in the AD-X2 controversy the Bureau's technical results were questioned, and seriously so. To be able to understand the issues pro and con of the Bureau's results, it is well to review briefly some facts about lead-acid batteries and the methods for testing them. The uninterested reader may skip this section and continue with the main text.

Figure 1 shows a cutaway view of a prototypical automotive lead-acid battery. The battery consists of a number of cells—three for a nominal 6-volt battery and six for a

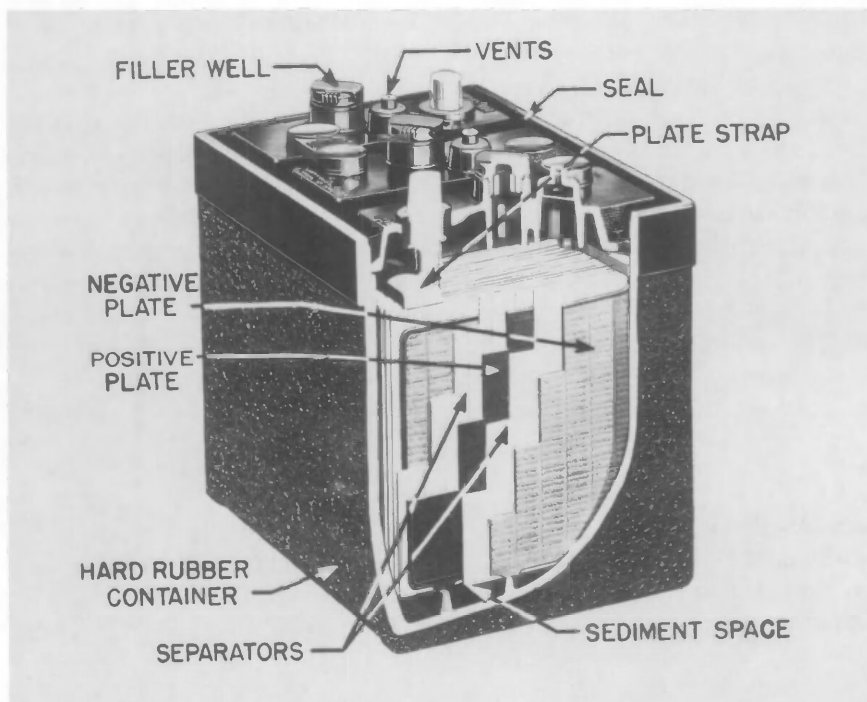


Figure 1. Cutaway view of a 1953 automotive lead-acid battery.

nominal 12-volt battery. Each cell consists of two electrodes—one positive and one negative—separated by a porous separator, often wood in the late 1940s and early 1950s, or one of various porous plastic materials. Current flows from the positive to negative electrodes in the external circuit and from negative to positive in the cell. The cells are filled with an electrolyte of dilute sulfuric acid to which the separator is highly permeable. The electrodes are made of lead-alloy plates, and each is formed into a grid to increase its surface area. These plates are covered with a highly porous paste whose composition is different for the two electrodes.

In a completely charged battery, the paste on the positive electrode consists of lead dioxide, while that on the negative electrode consists of spongy lead. These are called the “active materials.” During discharge, the paste on both the positive and negative electrodes is converted to lead sulfate. This process is called “sulfation” and is completely normal, but the term has another, and more subtle, meaning as will be described below. The sulfate comes from reactions with the sulfuric acid and water in the electrolyte and, as discharge proceeds, the acid concentration in the electrolyte decreases, and hence the specific gravity also decreases. These reactions provide the electromotive force that moves current through the external circuit. In a discharged battery, the paste on both electrodes is essentially lead sulfate. No further reaction can take place, and the battery can provide no electrical energy. In charging the battery the reverse reactions occur, and the positive and negative electrodes are converted back to their original condition. This is normal operation, except that the battery is not normally completely discharged.

So far, these are accepted facts, and there are no questions. The heart of the argument concerns the question of “sulfation,” and to understand this, it is important to review the reason for having a paste on the electrodes at all, rather than, say, making the electrodes (of automotive batteries) out of solid plates of the respective materials. The paste of active materials on both electrodes consists of very fine particles. These have an extremely high surface area, and hence the material of which they are composed is easily accessible to the electrolyte on either charging or discharging, and the appropriate chemical reactions can readily take place. However, if a fully (or even partially) discharged battery is stored for a long period, the fine particles (really fine crystals) of lead sulfate in the paste on both electrodes grow in size. As they do, the material in them becomes less and less accessible to the electrolyte, for either charge or discharge. The soft paste is converted to a hard, compact mass only slightly permeable to the electrolyte. In the second, and more subtle meaning of the term, such a battery is also said to be “sulfated,” even though not all of the active material is used up. Such a battery delivers little or no current, and is difficult to charge. Charging can, however, be carried out, and its efficiency is increased if it is done slowly and with cycling between charging and discharging steps. This is normal, and requires no additions to the battery, except possibly water if for some reason the battery has gone dry or the level of electrolyte is too low.

The proponents of battery additives (particularly those composed of Epsom and Glauber’s salts) claimed that if their additives were added to a new battery, such sulfation would be prevented, and if it were added to the electrolyte of a “sulfated” battery, the efficiency of charging would be increased. However, in their instructions

they did recommend that charging be done slowly, and in a series of charge-discharge steps. The central question was, therefore, "Do these additives really help, or can the same results be obtained without them?"

A related issue is the question of "battery mud." During the course of time, some of the active material falls off the electrodes and settles to the bottom of the cell. This is called "shedding" and the sediment is called "battery mud." If this process continues, the mud will eventually impinge on the two electrodes, thus shorting out the cells. Once a cell is shorted out it becomes useless. The proponents of Battery AD-X2 claimed that their additive would prevent battery mud or actually dissolve it.

A number of tests must be carried out to determine if an additive is indeed effective, or if the same results can be produced without it. One of the tests carried out on a battery is for "capacity." The capacity is the total electrical energy delivered by the battery, usually denoted by "ampere-hours," which is the product of the number of amperes and the time over which they are drawn. This product is directly related to the energy delivered, but its measurement is not simple, because the ampere-hours delivered depend upon the rate of discharge. Discharge at a high rate will yield a lower value than discharge at a slow rate. The reason for this is diffusion in the battery plates. All motorists have had the experience of trying to start their car with a weak battery, only to have the starting motor begin to grunt and finally stop. Upon waiting, with another trial the motor will again turn over, but for a shorter time. What has happened is that in the initial attempt to start the car, the electrolyte in the active material is used up, but there is still active material on the plates. Upon waiting, more electrolyte diffuses into the paste, and the battery will deliver energy again, but for a shorter time. This is the phenomenon that was usually the basis for saying that additives would "charge" batteries. The demonstration of this phenomenon will obviously depend upon the degree of sulfation. If the process is continued for a battery in a low state of charge, all the active material in the plates will be essentially used up, and the battery is effectively dead, although it may be charged again.

A related question is that of charging efficiency, which is the ratio of the ampere-hours delivered by the battery to the ampere-hours used in charging it. Again, this ratio depends on the rates of both charge and discharge. Most important, when comparing experiments with and without additives, the twelve batteries that are used must be in exactly the same condition. Since this is rarely possible, large numbers of batteries must be used for the two experiments, and then the problem becomes one of statistics in comparing the results.

Other, somewhat less important, questions that need to be investigated are the temperature rise on charging, the amount of water lost in the process, and the amount of sediment produced. All of these various factors played a role in determining the efficacy of additives, and in validating the Bureau's work.

These are all laboratory tests. Another way of assessing the value of battery additives is to carry out field tests. In such tests the additive is added to batteries in service and the results assessed. As in laboratory tests, comparison should be made with comparable batteries which have not received an additive but have otherwise received the same treatment (i.e., "controls"). But, and equally important, the batteries being compared should be used under the same service conditions, which is very hard to manage,

and is expensive. The ordinary testimonial is not based on these two crucial comparison factors, hence is scientifically invalid as a test of battery additives. The Bureau conducted no field tests; its results were based entirely on laboratory tests. The proponents of AD-X2 on, the other hand, relied almost exclusively on testimonials, although some tests (of little validity) were carried out on their behalf.

THE INCIDENT BEGINS

In 1948, the Electrochemistry Section under George W. Vinal was busily at work carrying out research for the military on a whole range of battery problems. On April 23, Vinal received a letter from Merle Randall, professor emeritus of chemistry of the University of California and a consultant in Berkeley. The letter merited attention due to Randall's reputation. He had cooperated with G. N. Lewis on the definitive text, *Thermodynamics and the Free Energy of Chemical Substances* in 1923. He had authored a text on physical chemistry, was well known for his research work, and had taught many distinguished students. Some of his recent work was on electrolytic theory. He wrote on the subject of "Protecto-Charge."³⁰ The letter reads in part:

One of my clients has purchased the equities in a patent application (Donald E. Kiefer) covering "Protecto-Charge," an addition agent for storage batteries. Frankly, both his patent attorney . . . and I were suspicious of the claims made for this product.

The "Protecto-Charge" process involves the addition of a powder mixture of anhydrous sodium sulfate and a slightly basic, nearly anhydrous, magnesium sulfate to the water while it is filled with standard sulfuric acid electrolyte. Curiously the result is quite different from that when equivalent amounts of sodium sulfate and Epsom salts are added. The active material remains "tight" to the grid and there is so little "shedding" of the active material that there is an apparent, possibly real, decrease in the amount of battery mud.

The letter goes on to point out a large number of satisfied users, all commercial. It also encloses an advertising brochure with the following claims:

1. Reduces harmful effects of "sulfation."
2. Ordinarily increases the capacity of mechanically sound "sulfated" batteries.
3. Helps prevent freezing.

³⁰ Letter, M. Randall to G. W. Vinal, April 23, 1948. (NARA; RG 167; Astin file; Box 10; Folder AD-X2 1948, Randall-Vinal). This is the name by which AD-X2 was originally known. It was changed to Battery AD-X2 in June 1948 because of a trademark problem with the Atlas Distributing Company. The AD in the name stood for "additive," the X for some unknown ingredient or agent, and the 2 for the main two constituents. (J. M. Ritchie testimony, AD-X2 Hearings: 71). The name is usually abbreviated to simply "AD-X2" and this is the custom that will be followed here. In the text the original name will be used until relating events occurring after the name change.

4. Restores to active service, approximately 70 percent of discarded "sulfated" batteries.
5. Lessens the chance of buckled plates and slowly decreases battery mud.
6. Remember, "PROTECTO-CHARGE" will restore your DEAD battery, providing there is no mechanical defect.³¹

The brochure goes on to describe rather sensibly and accurately the various causes of battery failure, and sulfation and its effects. It describes how to treat a run-down battery, and this description is valuable whether "Protecto-Charge" is used or not. It was obviously written by someone who knew about lead-acid batteries. The claims had, in fact, been approved by Randall. "I believe they are conservative," he wrote. Compared to claims made for other additives, these were in fact mild. Vinal, having heard the same thing many times, and because of the press of other work, put the letter aside despite its distinguished author.

The client Randall mentions at the beginning of his letter was an Oakland, California, company called Pioneers, Incorporated. Its president was Jess M. Ritchie, the main protagonist in the AD-X2 incident. He was an aggressive and charismatic entrepreneur with a varied background.³² Born in Arkansas in 1909, he was a self-educated engineer, having supplemented his sixth-grade education with correspondence courses. He worked as a certified bulldozer operator and a journeyman diesel engineer. After the end of World War II he served as a general superintendent of construction with headquarters in the Philippines for the Drake-Utah-Grove construction combine. "I am basically a bulldozer operator," he said of himself. "I was having trouble with batteries in the Philippines. I came back to Oakland, California, with an idea of doing something about it," he testified before the Senate.

When I came back from the islands, I had never heard about a battery dope in my life. I had never heard anything about it. And I ran into this fellow [Donald E. Kiefer] on East 14th Street and bought a half interest in the business. And what I bought there was a tremendous amount of trouble.

Business was poor, and the additive was harmful to batteries, but feeling he could develop a good product, he bought out his partner. He "ran into Merle Randall" and, after checking at the University of California and the Stanford Research Institute, hired him as a consultant. Together they began experimenting and ran more than 1600 experiments. Then occurred a serendipitous accident in which an experimental batch was "left . . . in process by accident, and when it came out it looked something like melted glass, and I wanted to throw it away. Well, Dr. Randall insisted on using it. So we used it."³³ Thus was Protecto-Charge born, according to Ritchie. His testimony is

³¹ Pioneers, Inc., "6 Reasons Why You Should Use Battery 'Protecto-Charge,'" edited and approved by Dr. Merle Randall, 1946. (NARA; RG 167; Astin file; Box 10; Folder AD-X2 1948, Randall-Vinal)

³² Samuel A. Lawrence, *The Battery Additive Controversy* (University of Alabama Press, 1962); J. M. Ritchie testimony, AD-X2 Hearings: 11-209.

³³ J. M. Ritchie testimony, AD-X2 Hearings: 17-20.

unclear about whether anything other than sodium and magnesium sulfates was used, but he was later to imply that something was. Subsequent chemical analysis by the Bureau indicated that the material did not contain anything but sodium and magnesium sulfates, with other elements at the impurity level.

Ritchie marketed his new product solely to commercial and industrial users. Sales began to pick up and by 1948 they were quite brisk. He decided not to patent the discovery, preferring to keep his process and formulation secret. However, the brochure for Protecto-Charge states "Patent Pending."

Ritchie did not know about LC 302 or the NBBB publication *Facts About Battery Dopes*, but he quickly learned about them. He recalled:

So I got going, and while I was talking to a fellow one day he said, "Have you seen Letter Circular 302?"

I said, "No; what is Letter Circular 302?"

"Well," he said, "something that was put out by the Bureau of Standards some years ago. A battery salesman was out yesterday and showed it to me."

I said Dr. Randall had mentioned that he had found it in the literature, but it was 1931, and I didn't pay too much attention to him.

Now *Facts About Battery Dopes* was a rehash of Letter Circular 302. . . .

Dr. Randall was concerned. I wasn't. We are talking about a document way back there in ancient history.³⁴

THE INCIDENT DEVELOPS

Ritchie, in fact, became deeply concerned. He began a strategy to have the Bureau make an exception for his product. Irritated that the Bureau had not tested it and had lumped it for condemnation with all other additives, his main purpose was to have the Bureau test it, probably sincerely believing that the Bureau would find that it indeed had merit. He began a three-pronged effort: (1) with Randall corresponding with the Bureau, (2) using the Oakland Better Business Bureau, of which he was a member and with which he had friendly relations, and (3) on the political front.

Thus, when Vinal did not reply to his letter of April 23, 1948, Randall wrote again on June 25. He enclosed a test which he considered severe. He had developed it for battery additives and told about favorable results (on a single battery) with Protecto-Charge as compared to Epsom and Glauber's salts. Hereafter this test will be referred to as the "Randall Test."³⁵

This time Vinal replied at some length. He repeated the Bureau's experience with additives of sodium and magnesium sulfates, and how, once in solution, there can be no difference between Epsom and Glauber's salts and their anhydrous variations. He told of new, unpublished experiments that confirmed this experience. He enclosed a copy of LC 302 with the statement, "I have no reason to change the statements contained in this pamphlet."³⁶ Correspondence continued throughout the year,

³⁴ J. M. Ritchie testimony, AD-X2 Hearings: 19.

³⁵ Letter, M. Randall to G. W. Vinal, June 25, 1948. (NARA; RG 167; Astin file; Box 10; Folder AD-X2 1948, Randall-Vinal)

³⁶ Letter G. W. Vinal to M. Randall, July 1, 1948. (NARA; RG 167; Astin file; Box 3; Folder AD-X2 (2))

becoming rather testy toward the end, by which time both men had tacitly agreed to disagree.³⁷

Pressure on Vinal also came from the Oakland Better Business Bureau (OBBB). In fact, the general manager of the OBBB had been in correspondence with Ritchie. "The Better Business Bureau of Metropolitan Oakland has never received complaints of any nature concerning your company," Jack A. Harris wrote to Ritchie on November 26, 1948. The letter continues:

Information received . . . from the Bureau of Standards indicates that the Bureau of Standards has not tested your product and have [sic] categorically classified it as a battery dope. At the present time, we are endeavoring to obtain from the Bureau of Standards a full report on your product, . . . [W]e are sending the Bureau of Standards a sample of your product that they may make the necessary examination.³⁸

Thus, on December 1, 1948, Harris wrote to Vinal asking that a sample of AD-X2 be tested so that, "it will be possible for us to have the expert opinion of the Bureau of Standards and that we may then determine whether or not this product can justly be sold as a non-harmful product to aid in lengthening the life of storage batteries."³⁹ Vinal was caught. He could not agree to test the product or identify it in Bureau publications without going against long-standing Bureau policies. In his reply he stated that the reason the Bureau did not test AD-X2 was its long experience with additives consisting of sodium and magnesium sulfates and, according to Randall, this was the composition of the product. Moreover, three competent military laboratories were now testing it, and "in view of the above fact it does not seem desirable for a fourth Government agency . . . to spend the time urgently needed for Army and Navy work to make further tests of these materials." He then quoted the Bureau policy on tests, "This Bureau does not make commercial tests of batteries or battery materials and it is an established policy of the Bureau not to endorse commercial products or to permit the results of its tests to be used for advertising purposes."⁴⁰

On the political front, Ritchie appealed to Senator William Knowland, a resident of Oakland. He wrote a long letter to the Senator on December 3, 1948, asking "the Senator for his assistance as regards the attitude of the National Bureau of Standards to our product AD-X2" Giving a short history and description of his product, pointing out his many satisfied users, and stating that the Bureau had not tested it, he

³⁷ Letter, E. U. Condon to M. Randall, September 12, 1949, in belated response to a letter of Randall to Condon, January 10, 1949. (NARA; RG 167; Astin file; Box 10; Folder AD-X2 1949)

³⁸ Letter, J. A. Harris to J. W. Ritchie, November 26, 1948. (NARA; RG 167; Astin file; Box 3; Folder AD-X2 (2))

³⁹ Letter, J. A. Harris to G. W. Vinal, December 1, 1948. (NARA; RG 167; Astin file; Box 3; Folder AD-X2 (2))

⁴⁰ Letter, G. W. Vinal to J. A. Harris, December 22, 1948. (NARA; RG 167; Astin file; Box 3; Folder AD-X2 (2))



California Senator William F. Knowland from Oakland wrote to NBS Director Condon on December 9, 1948, requesting that the Bureau test AD-X2. Knowland's letter on behalf of his constituent prompted the Bureau to make tests on the additive. First intended to be kept confidential, the test results were disclosed to the National Better Business Bureau, precipitating a major controversy. (AP-Wide World Photos)

wrote, "until such time as they check our claims we feel that our product is being condemned without the benefit of trial, and has been for the past year and a half."⁴¹

On December 9, Knowland wrote a short letter to Condon enclosing the file Ritchie had sent him. The letter closes:

I, of course, have no personal knowledge of the claims made for this particular product. However, reputable people are associated with the firm and well known business organizations have been making use of their product. If in line with the policy of the Bureau of Standards it would be appreciated if such a test could be made so that this product could stand on its own merits.⁴²

Condon, in turn, wrote to Knowland on December 20. After a short account of the Bureau's involvement with battery additives and AD-X2, he wrote, "In view of Dr. Randall's statement it is obvious that "AD-X2" does not differ significantly from

⁴¹ Letter, J. M. Ritchie to Senator W. F. Knowland, December 3, 1948. (NARA; RG 167; Astin file; Box 10; Folder Senator Knowland)

⁴² Letter, Senator W. F. Knowland to E. U. Condon, December 9, 1948. (NARA; RG 167; Astin file; Box 10; Folder Senator Knowland)

other materials tested. Hence it does not seem desirable for this Bureau to go into the matter further."⁴³ Condon had refused to test AD-X2. And, of course, he was essentially constrained not to test it by Bureau policy. Knowland's letter, however, lay there like an unsatisfied demand, and was to prove instrumental in causing the Bureau to test AD-X2.

Condon's letter to Knowland was sent on to Ritchie, and Randall tartly wrote to Condon about it:

The objections properly raised by Dr. Vinal in Circular 302 with respect to the battery additives previously tested at the Bureau do not apply to "AD-X2," which should be specifically exempted from those implications. . . . The reputation of the National Bureau of Standards is too precious to be dulled by an attitude based on preconceived notions . . . I wish to assure you that I too, value my reputation, and that if I had found anything to point to false claims by Pioneers, Inc., that I would not continue as a Consultant for them.⁴⁴

The nature of the controversy was becoming clear.

THE NATIONAL BETTER BUSINESS BUREAU

As already mentioned, the Bureau was in correspondence with the National Better Business Bureau (NBBB) from the earliest days of its additive testing and since the NBBB publication of *Facts About Battery Dopes*. Now the NBBB became concerned about that publication. It was, after all, a document based on the Bureau's LC 302, which dated from 1931. Since that date many new additives had come on the market, and the postwar years had seen a veritable explosion of them. The Bureau itself had tested 26 between 1931 and the end of 1947. A full 18 of these were tested after 1940, when *Facts About Battery Dopes* was published. The NBBB began to wonder if LC 302 should be brought up to date. Thus, quite independently of the AD-X2 matter, Kenneth B. Willson, Operations Manager of the NBBB, wrote to Vinal about this on June 10, 1948. Vinal replied on June 25 before he had replied to Randall's initial letter. Perhaps with "Protecto-Charge" in mind, he wrote, "This is in reply to your letter . . . regarding battery compounds which seem to be becoming increasingly numerous and troublesome." He then wrote that at the present time he saw no reason to change the statements in LC 302, but that he "had it in mind for some time that we should issue a new letter circular to supersede the present 302, and . . . incorporate some of the data more recently obtained. . . . I shall be glad to have your opinion as to the desirability of issuing an up-to-date statement of the problem."⁴⁵ Vinal's request for the advice of the NBBB was unfortunate, for it made it seem that the Bureau was in some sense an agent of a private institution.

⁴³ Letter, E. U. Condon to Senator W. F. Knowland, December 20, 1948. (NARA; RG 167; Astin file; Box 10; Folder Senator Knowland)

⁴⁴ Letter, M. Randall to E. U. Condon, January 10, 1949. (NARA; RG 167; Astin file; Box 10; Folder AD-X2 1948, Randall-Vinal)

⁴⁵ Letter, G. W. Vinal to K. B. Willson, June 25, 1948. (NARA; RG 167; Astin file; Box 3; Folder AD-X2 (2))

Vinal did prepare a revision of LC 302 in the fall of 1948, but in the process of pre-publication review, Bureau management decided that a completely new document was required. But the NBBB was anxious to revise its own pamphlet, and in lieu of a new report, the Bureau provided the NBBB with a statement from Director Condon. This statement reiterated the Bureau's position that battery additives were without merit, and specifically singled out Epsom and Glauber's salts—and "analogous materials"—for mention. The statement concluded with the paragraph:

It is still evident that the best electrolyte for a storage battery is that presently used by the battery manufacturers since years of research and experience have shown no other materials superior to the customary sulfuric acid electrolyte of proper specific gravity.⁴⁶

The NBBB used this statement to prepare its own publication, and issued a Service Bulletin, *Battery Compounds and Solutions*, published on March 16, 1949. Along with the Condon statement, this bulletin warns that manufacturers' guarantees are voided by the introduction of "battery dope" into their batteries. It was clear that the NBBB had split from the OBBB, which insisted that the Bureau test AD-X2.

THE MILITARY TESTS

While all these activities were going on, there was action in another area. The military, inheritors of thousands of war-surplus batteries, most in poor condition, was looking at ways to save them. Beginning as early as 1947, they began testing AD-X2, still called "Protecto-Charge." There were a total of eleven installations, but the main tests were carried out at six locations: The Squire Signal Corps Laboratory at Fort Monmouth, New Jersey; the New York Navy Shipyard; the Mare Island Navy Yard; the Detroit Arsenal; Benicia Arsenal, Benicia, California; and the Aberdeen Proving Grounds in Maryland. Two of these—Benicia and Aberdeen—returned positive results, while the others were negative. Vinal criticized the tests with positive results, as did the military itself for the Benicia results, stating, "Of course, they do not say the same batteries would have worked equally well had they been given a slow charge without the use of any compound."⁴⁷ Perhaps influenced by negative results with all other additives, the military stopped purchases and testing of AD-X2. This left some unhappy battery technicians in the service, for they believed in the product.

⁴⁶ Letter, E. U. Condon to K. B. Willson, March 9, 1949. "Statement About Battery Compounds and Solutions" is attached. (NARA; RG 167; Astin file; Box 3; Folder AD-X2 (2))

⁴⁷ Memorandum, G. W. Vinal to E. U. Condon, January 17, 1949; letter, G. W. Vinal to K. B. Willson, June 10, 1949. (NARA; RG 167; Astin file; Box 10; Folder AD-X2 1948, Randall-Vinal)

THE BUREAU TESTS AD-X2 AND THE PACE QUICKENS

By early 1949, the outlines of the controversy and the positions of the contestants were essentially laid out. The Bureau was adamant that all battery additives based on sodium and magnesium sulfates were worthless, though not necessarily harmful. Led by Randall, Pioneers was equally adamant that AD-X2 was a valuable and useful product. The OBBB, based on the fact that there were no complaints about AD-X2, was solidly behind Pioneers. The NBBB was solidly behind the Bureau, and used its results in its own publications, but they were nervous because it—and all the other contestants—believed the Bureau had not tested AD-X2.

The Bureau had, in fact, tested it. In January 1949, having tests to run for the FTC on another—but unrelated—additive, Vinal included AD-X2 in the tests because this could be done with little extra effort. The tests were done at his initiative and for his own edification, but Senator Knowland's letter was an added stimulus.⁴⁸ Using the samples of material furnished by the OBBB, AD-X2 was tested on two batteries, a new one and an old one.⁴⁹ Vinal found no reason to change his position. He did not, of course, publish these results or make them known to anyone outside the Bureau since this would involve identification of a proprietary product which was against Bureau policy. In fact, in June 1949, Vinal was still not admitting to having tested AD-X2. On June 17, Willson of the NBBB wrote to Vinal asking him to test AD-X2, and on June 22 Vinal replied, "It has been our policy not to make any tests on commercial products until requested to do so by some Government agency which is interested in the merits of the product. If this matter is turned over to FTC it is possible we may be requested to make tests."⁵⁰ This last phrase was subsequently interpreted to be a subtle attempt by the Bureau to have the FTC investigate Pioneers.

During 1949, Randall shifted his letter writing from Vinal to Condon, and became more assertive. In a series of letters through the whole of 1949, he extolled the virtues of AD-X2, repeated the field experience of numerous satisfied users, attacked the negative military results, and repeated his own successful experiments. Condon answered all the letters, his replies undoubtedly written by Vinal, pointing out that the field experience was flawed in that it did not show that the same results could have been achieved by a similar treatment without the additive, and also pointing out flaws in Randall's experiments and logical fallacies in his conclusions. Condon and Randall also tacitly agreed to disagree.

Now a new and significant player—the Federal Trade Commission—entered the fray. The NBBB, armed with the Condon statement which they had published in their Bulletin, lodged a complaint with the FTC, asking it to investigate Pioneers for false advertising claims. Thereupon the FTC ordered its San Francisco office to look into the situation.

⁴⁸ A. V. Astin testimony, AD-X2 Hearings: 314.

⁴⁹ Lawrence, *Battery Additive Controversy*, p. 7.

⁵⁰ Letter, G. W. Vinal to K. B. Willson, June 22, 1949. (NARA; RG 167; Astin file; Box 3; Folder NBBB and Memo Sent to SSBC)

The investigators were nonplussed. They found that AD-X2 had many satisfied customers in the Bay area—including some personnel at military installations—and was highly regarded. The OBBB was strongly supportive of AD-X2, and in fact Harris of the OBBB wrote to Willson of the NBBB on August 30, 1949:

Here, Ken, is the issue as I see it. In my opinion neither you nor the National Better Business Bureau nor any other organization on God's green earth have the right to participate in preventing a man from carrying on free enterprise by direct or indirect means unless there is a reasonable basis for such an action.⁵¹

In view of this situation, the San Francisco FTC office recommended to Washington in February 1950 that they have the Bureau test AD-X2.

In the meantime, Ritchie expanded his operations. He appointed dealers in various cities on the West Coast. Those dealers not only sold his product, but reconditioned old batteries and sold them at highly reduced prices with a one-year guarantee. This was of deep concern to battery manufacturers, and one of them, Keystone Batteries of San Francisco, expressed this concern to the American Association of Battery Manufacturers in a letter on February 2, 1950.⁵² Enclosing a copy of the Keystone letter, that organization then wrote to the FTC on March 10, "We believe the FTC should take some action in regard to the enclosed complaint in the interest of both battery manufacturers and battery consumers. Before doing so a careful analysis of this material should be made. . . ." ⁵³

As a result of these two requests, on March 22, 1950, the FTC asked the Bureau to test AD-X2. The Bureau was asked to determine if six advertising claims "may properly be made" for the product.⁵⁴ On May 11, 1950, the Bureau reported that a series of tests had failed to demonstrate any reduction in harmful sulfation.⁵⁵ But events would conspire to force the Bureau to go public with its results even before it reported to the FTC.

THE BUREAU GOES PUBLIC ON AD-X2

After the issuance of the NBBB Bulletin *Battery Compounds and Solutions* containing the Condon statement, Ritchie's promotional literature claimed that statements made by the Bureau and the NBBB did not apply to AD-X2 because the Bureau had not tested it. As a result, the NBBB was swamped with requests for clarification. This

⁵¹ Letter, J. A. Harris to K. B. Willson, August 30, 1949. (AD-X2 Hearings: 78-79)

⁵² Letter, W. Brizee, Secretary, Keystone Batteries, to V. L. Smithers, Commissioner, The Association of American Battery Manufacturers, February 2, 1950. (AD-X2 Hearings: 514-515)

⁵³ Letter, V. L. Smithers, Commissioner, The Association of American Battery Manufacturers, to the Federal Trade Commission, March 10, 1950. (AD-X2 Hearings: 515)

⁵⁴ Letter, I. Burton, Acting Chief Examiner, Federal Trade Commission, to National Bureau of Standards, March 22, 1950.

⁵⁵ National Bureau of Standards, "Report of Test of 'AD-X2' Battery Material Submitted by Federal Trade Commission," George W. Vinal, Chief, Electrochemistry Section, May 11, 1950,

was bothersome enough, but the issue became more serious. On March 29, 1950, Willson of the NBBB wrote to Vinal:

[W]e have considered sending a bulletin to battery manufacturers . . . because Pioneers, Inc., apparently has been pursuing a deliberate course of making inquiry of various manufacturers and their dealers in regard to the product—AD-X2. When they receive in reply a copy of our bulletin . . . they believe they have evidence to show that through the distribution of our bulletin we and the manufacturers distributing it are damaging their business. I do not know what they intend to do with this “evidence,” but in view of certain threats which they have made about possible action against the manufacturers, we felt dutybound to put them on notice.

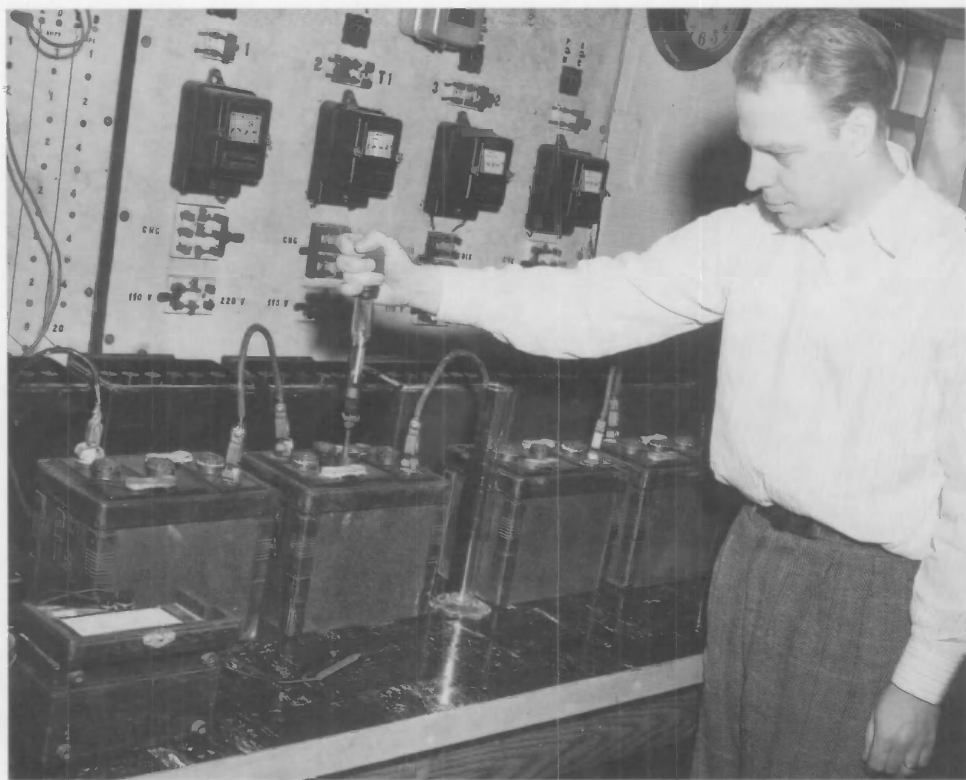
However, Dr. Vinal, there would be no need for us to issue any statement to battery manufacturers, or to anyone else, on this subject if you would permit us to inform Pioneers, Inc., that you have now concluded a comprehensive test of AD-X2, and that you found that AD-X2 is not effective and therefore does not serve a useful purpose. . . . If we now can tell Pioneers, Inc., that you have tested their product and found it wanting, they may continue to dispute your findings and conclusions but they cannot claim that they are based upon theory and not an intimate knowledge of the product.⁵⁶

At the time Vinal received this letter, he had the results of the tests carried out on his own initiative in January 1949, but he had gone further. Approximately six months before, he had begun a series of tests designed to provide information for the revision of LC 302. For this purpose he had chosen five used batteries which were badly sulfated. Two of these were treated with commercial additives—one of them AD-X2—and the remainder with laboratory-prepared mixtures of sodium and magnesium sulfates of differing compositions. One cell of each battery was used as a control, i.e., had no additive added. He also had a chemical analysis of AD-X2 carried out as part of the FTC tests. These showed that the material was 46.6 percent magnesium sulfate and 42.9 percent sodium sulfate, with the remainder water of hydration. Further analysis showed that the sodium sulfate was anhydrous, and that the water was attached to the magnesium sulfate, so that its composition was approximately $\text{MgSO}_4 \cdot 1.2\text{H}_2\text{O}$.⁵⁷ Armed with the results of these tests, on April 5, 1950, Vinal replied to Willson as follows:

After talking the matter over with administrative officials and several of our Technical staff, I think it appropriate for you to transmit the following statement to Pioneers, Inc., if you wish to do so.

⁵⁶ Letter, K. B. Willson to G. W. Vinal, March 29, 1950. (NARA; RG 167; Astin file; Box 3; Folder AD-X2 (2)) Lawrence, *Battery Additive Controversy*, p. 9, states that Willson wrote to Vinal that he was afraid Pioneers would sue. There is no mention of a suit in this letter, although there is an implication of a possible one.

⁵⁷ National Bureau of Standards, “Report on Examination of Battery Additives Submitted by Federal Trade Commission thru Division 1, Section 8,” James I. Hoffman, Chief, Surface Chemistry Section, April 13, 1950.



Automotive (front row) and aircraft (back row) batteries were studied by NBS to determine the effect of magnesium and sodium sulfate additives on their performance and useful life. In this photograph, Herbert J. Reed of the Electrochemistry Section measured specific gravity. The measurements showed no significant difference between treated and untreated cells. The results of these experiments were the basis for the Bureau's Circular 504, *Battery Additives*, by Paul L. Howard and George W. Vinal.

At your request for information relative to this Bureau's work on battery additives and on one known as AD-X2 in particular, it may be stated that the Bureau, for its own information, has made extended experiments recently, the results of which confirm our previous conclusions that magnesium sulfate and sodium sulfate are not effective as alleged in restoring storage batteries or in prolonging their life. On the basis of these recent experiments we have no reason to modify statements previously made in our Letter Circular 302.

These experiments were initiated to obtain data on several battery additives at present being sold to the public as well as on a wide range of compositions which the Bureau prepared. AD-X2 was therefore included in these tests. The samples of AD-X2 used in these tests were received from the Better Business Bureau of Oakland, Calif. In the preparation of the report the battery additives actually used are designated in code. The Bureau was fortunate in procuring a group of batteries in sound mechanical condition but

sulfated as a result of long standing. Tests of these extended over six months and it is now possible to say that the results show no benefit from the use of these additives, including AD-X2.⁵⁸

Ritchie had achieved his goal of having the Bureau test his product, but the results were not those he had hoped for. His battle with the Bureau would have to move to another arena.

And Ritchie's problems would soon increase. The NBBB was not satisfied merely to transmit the Bureau's results to Pioneers; it wanted to make them public. Accordingly, it prepared a statement based on Vinal's letter to be issued along with its *Bulletin Battery Compounds and Solutions*. By letter from Willson to Vinal on July 19, 1950, it requested permission to use the statement. The Bureau, its position evidently hardening, went against its long-standing policy in a letter from Condon to Willson on July 24, 1950, and authorized use of the statement in the NBBB Bulletin.⁵⁹ The Bulletin was published in August 1950.⁶⁰ The key paragraph from the Bureau's statement reads:

In view of the tests made here and in competent laboratories elsewhere it is our belief that AD-X2 is not essentially different from other preparations containing magnesium sulfate and sodium sulfate, and that as a class these materials are not beneficial. The results of recent tests are being prepared for issuance as a Bureau circular but in the meantime we see no reason to modify Letter Circular 302.

The statement also makes clear that the Bureau had tested AD-X2:

These experiments were initiated to obtain data on several battery additives at present being sold to the public as well as on a wide range of compositions which the Bureau prepared. AD-X2 was therefore included in these tests.

A paragraph on work done elsewhere reads:

We have also the results of tests made elsewhere on 200 batteries in actual service on automobiles which were treated with AD-X2. A sufficient number of cells in these batteries were kept in the untreated condition for comparison with the results of those treated. Here again the results show no evidence of beneficial effects of AD-X2.

The NBBB did allow Pioneers to make a dissenting statement. It was short:

In the correspondence between us it has been mentioned many times by both Dr. Randall and ourselves that it is difficult to make a really definitive

⁵⁸ Letter, G. W. Vinal to K. B. Willson, April 5, 1950. (NARA; RG 167; Astin file; Box 3; Folder AD-X2 (2))

⁵⁹ Letters, K. B. Willson to G. W. Vinal, July 19, 1950; E. U. Condon to K. B. Willson, July 24, 1950. (NARA; RG 167; Astin file; Box 3; Folder AD-X2 (2))

⁶⁰ National Better Business Bureau, "Battery Compounds and Solutions," August 1950.

laboratory test of Battery AD-X2 and that the only practical means of determining the value of the product is through field test.⁶¹

As to the field test by the National Bureau of Standards we note that they have definitely stated . . . that such a test or tests was made on batteries in actual service. We are well aware of this but . . . these tests were not run in accordance with our specifications and therefore did not indicate the value to be derived from our product.

The field tests referred to in the statement were not, in fact, the Bureau's tests but were carried out by the Ordnance Department of the Army. However, Ritchie's statement that these tests were not carried out "in accordance with [his] specifications" would be his rallying cry for the remainder of the incident.

The NBBB distributed 50 000 copies of the Bulletin.⁶² Its publication and distribution had a totally unanticipated effect. *Newsweek*, sensing a dispute and quoting the experience of many satisfied users, published an article highly favorable to AD-X2. Other articles favorable to AD-X2 appeared in *American City*, *Western Construction News*, *Western Industry*, and *Batterymen*.⁶³ It seemed as if a mighty Government agency was beating up on a small, helpless manufacturer. Ritchie's sales soared.

This did not last long. Vinal had been working on the revision of LC 302, and on January 10, 1951, the Bureau published Circular 504, *Battery Additives*, a definitive statement of the Bureau's results—the same five tests it had used to allow the NBBB to identify AD-X2. In this publication, the additives were coded so that the Bureau did not name AD-X2.⁶⁴ But the circular went beyond the laboratory results. It quoted the field tests carried out by the Army Ordnance Corps on 200 batteries in various conditions, including 100 new ones, half treated and half untreated. Both laboratory and field tests clearly showed that AD-X2 had no beneficial effect. As a result, the circular concluded, "there has been no improvement found in the use of a series of commercial and specially prepared additives composed of magnesium and sodium sulfates either hydrated, partially hydrated or anhydrous." In its new definitive publication, the Bureau upheld the conclusions of its old LC 302. The wording here is important. The Bureau did not find that AD-X2 and its analogues were harmful; it merely found that it provided no improvement. Would another set of different tests demonstrate improvement? A definitive "no" cannot be given as answer. A negative is difficult to prove.

⁶¹ It is interesting to note that during the development of AD-X2, Ritchie and Randall relied only on laboratory tests to determine the value of their product.

⁶² Letter, K. B. Willson to Paul L. Howard (Vinal's assistant), October 31, 1950. (NARA; RG 167; Astin file; Box 3; Folder AD-X2 (2))

⁶³ J. M. Ritchie testimony. AD-X2 Hearings: 24. Some of these articles may have been stimulated by Ritchie.

⁶⁴ It should be noted that the Bureau never identified AD-X2 in its own publications until April 1953 in *Report on Battery Additives by the National Bureau of Standards*, National Bureau of Standards Report 2447. This report was administratively restricted. It did permit the NBBB to identify AD-X2 in August 1951, but any interested reader can easily deduce that AD-X2 was "mixture C" in the tests prior to this time.

Circular 504 was followed by three publications designed to advertise its findings. A Commerce Department press release came shortly after its publication. This was followed in April 1951 by Technical Report 1537, which went to the technical and trade press, and was suitable as a basis for a technical article. And in May, an article describing the results and conclusions appeared in the Bureau's *Technical News Bulletin*. Ritchie called it "a perpetual news release."⁶⁵

These publications had a drastic effect on Ritchie's business. His sales fell from a high of \$75 000 in the first quarter of 1951 to \$40 000 in the final quarter, and continued to decrease.⁶⁶ He encountered difficulties in getting his side of the story in the press and, under pressure of battery manufacturers, the press was loath to accept his advertising.

Up to this time Ritchie had had little personal contact with the Bureau, leaving this to Randall. But Randall died on March 19, 1950, and a year later Ritchie—three months after the publication of Circular 504—was still trying to get the Bureau to make an exception for his product on the basis that the Bureau had not tested it, somehow still believing that the Bureau had not tested AD-X2. On May 29, 1951, and again on June 29, 1951, he wrote to the Bureau asking, "Has the National Bureau of Standards ever tested Battery AD-X2. . . ." Since George Vinal retired on June 30, 1950, replies came from Walter J. Hamer, who had succeeded Vinal as chief of the Electrochemistry Section. He wrote:

I felt that you were aware of our tests in view of the Bulletin of the National Better Business Bureau, and was somewhat puzzled by your question. . . .

I find that the statements appearing in the issue of August 1950 of the National Better Business Bureau had the approval of our administrative officials. Your correspondence to us and to them requesting that an exception be made publicly to "Battery AD-X2" on the grounds that the National Bureau of Standards had not tested this material had a bearing on this decision.⁶⁷

Ritchie would not get the Bureau to change its position. This fight would have to be taken to yet another arena.

⁶⁵ Lawrence, *Battery Additive Controversy*: 10; U.S. Department of Commerce, National Bureau of Standards. "Battery Additives," Press release TRG-6116; U.S. Department of Commerce, National Bureau of Standards. "Battery Additives," Technical Report 1537, April 1951; "An Investigation of Battery Additives," Technical News Bulletin 35, no. 5 (May 1951): 63-65.

⁶⁶ Lawrence, *Battery Additive Controversy*: 10.

⁶⁷ Letters, J. M. Ritchie to W. J. Hamer, May 29, 1951; W. J. Hamer to J. M. Ritchie, June 5, 1951; J. M. Ritchie to W. J. Hamer, June 29, 1951; W. J. Hamer to J. M. Ritchie, July 9, 1951. (NARA; RG 167; Astin file; Box 3; Folder AD-X2 (3))

RITCHIE GOES POLITICAL

Having developed a national network of "distributors, prospective distributors and interested parties," Ritchie used that network to bring political pressure on the Bureau. He wrote to them on August 21, 1951, of his intentions to bring about a Senate investigation of the Bureau. "The way we got action," he testified, "was the distributors wrote to the Senators, the Senators wrote to the Bureau of Standards, the Bureau of Standards wrote back to the Senators, and the Senators sent it back to their constituent, who was our distributor, and they sent it to us, and we could see how they were thinking. That is the way 24 Senators got tangled up in it."⁶⁸ There were, in fact, twenty-eight senators and one congressman who wrote to the Bureau between July and December 1951, some more than once, so that there was a total of forty congressional letters. In addition, many of the distributors wrote directly to the Bureau with requests that an exception be made for AD-X2. The Bureau technical staff, already overloaded with more battery testing, were kept so busy answering the congressional and other letters that they wrote a document, "Memorandum on Battery Additives,"⁶⁹ to be sent in response to inquiries. This memorandum "gives the position and policy of this Bureau on the testing of additives and gives some pertinent facts on the use of additives in storage batteries."⁷⁰

The senators' letters enclosed letters from their constituents, and ran to a pattern, described by the Bureau in a letter to Senator Herbert H. Lehman on August 31, 1951:

During the past months 20 other Senators and one Congressman have been contacted by the distributors of "Battery AD-X2". . . . a consistent pattern is evident in their approach. So far their letters fall into three groups: (1) the first stated that the National Bureau of Standards refused to test their material; (2) the second stated that their material was not field tested at this Bureau and stated or inferred that laboratory tests are insignificant; and (3) the third stated that laboratory tests are after all significant but that the laboratory tests of this Bureau are not. Most distributors or expounders of battery additives claim that their materials are not properly tested. They have made this claim for the past 25 years. However, their recommended methods of test change as each previous one is refuted.⁷¹

And in another letter to the same senator:

It would appear that those interested in promoting Battery AD-X2 cannot be satisfied unless the National Bureau of Standards specifically exempts Battery AD-X2. . . . This cannot be done (1) because it would be contrary to the conclusive results of the carefully planned and conducted experiments

⁶⁸ J. M. Ritchie testimony, AD-X2 Hearings, p. 48.

⁶⁹ National Bureau of Standards, "Memorandum on Battery Additives," August 28, 1951.

⁷⁰ Letter, E. U. Condon to Senator H. H. Lehman, signed by A. V. Astin, August 31, 1951. (NARA; RG 167; Astin file; Box 3; Folder AD-X2(4))

⁷¹ *Ibid.*

reported in the circular and (2) because it would be contrary to the long-established policy of the National Bureau of Standards, which is to give neither public condemnation nor endorsement to any specific brand-named product.⁷²

The letter clearly showed the Bureau's view of the situation, and that the Bureau was not about to budge.

As Ritchie's letter-writing campaign got under way, an important event occurred. On August 10, 1951, while the Bureau was celebrating its fiftieth anniversary, Condon submitted his resignation as director of the Bureau effective September 30. Allen V. Astin, who had been at the Bureau since 1930, was appointed acting director.⁷³ Astin was recognized for his administrative abilities, and as a distinguished scientist for his work on electrical standards and telemetry before World War II, and particularly for the proximity fuze during the War. He became the Bureau's main protagonist for the remainder of the AD-X2 incident.

THE POST OFFICE ENTERS THE FRAY, AND THE FEDERAL TRADE COMMISSION TAKES ANOTHER LOOK

While Ritchie's political campaign was moving along well in the Congress, unknown to him serious problems were about to arise for him in the Executive Branch. On September 6, 1951, while Ritchie's senator-writing campaign was in full swing, C. C. Garner, chief inspector of the Post Office Department, wrote to the director of the Bureau in regard to "Alleged violation of Section 130.52, P. L. and R., by Pioneers, Inc., Jess M. Ritchie; sale of battery charger - Eighty [sic] X-2," and enclosing "three envelopes containing . . . AD-X2." The POD was asking the Bureau for another test of AD-X2 to see if it met "all the claims made for it in the literature."⁷⁴

The Bureau submitted a report on December 12, 1951. Its chemical analysis showed the material to be a "mixture of partially hydrated sodium and magnesium sulfates."

The electrical tests were conducted on two batteries, with two cells in each being treated and the remaining cell used as a control. The results were that "'Battery AD-X2' . . . has no beneficial effects on the performance of lead-acid batteries."⁷⁵

⁷² Letter, A. V. Astin to Senator H. H. Lehman, October 17, 1951. (NARA; RG 167; Astin file; Box 3; Folder AD-X2(4))

⁷³ A short biography of Astin is in MFP, and a longer one is by Elio Passaglia, *Science: Evidence, Truth & Integrity*. Short biographies of Astin and Condon are also given in Chapter 3.

⁷⁴ Letter, C. C. Garner, Chief Post Office Inspector, to NBS director, September 6, 1951. (NARA; RG 167; Astin file; Box 11; Folder P.O. & F.T.C. re AD-X2)

⁷⁵ National Bureau of Standards, "Report on Examination of Battery Additive AD-X2 Submitted by Post Office Department thru Division 1, Section 8, Project No. 0199," James I. Hoffman, Chief, Surface Chemistry Section, December 10, 1951; National Bureau of Standards, "Report of Test of 'Battery AD-X2' Battery Additive Submitted by Post Office Department, Case No. 85372-F," Walter J. Hamer, Chief, Electrochemistry Section, December 12, 1951.

In five separate chemical analyses of lots of AD-X2, the chemical composition was quite variable. The Bureau's results for magnesium sulfate, sodium sulfate, and water, respectively, were, in percent, (1) 46.9, 42.9, 10.9; (2) 40.6, 38.9, 20.5; (3) 41.5, 37.2, 21.3; (4) 46.1, 43.0, 10.9; (5) 53.0, 35.8, 11.2. There was only a trace of magnesium oxide, and a number of other elements at the impurity level of composition. Significantly, the trace impurities were the same and of similar concentration as those found in commercial battery electrolyte and technical sulfuric acid.

On March 18, 1952, the POD formulated a complaint against Pioneers alleging that they were engaged in attempting to obtain money "through the United States mails by means of false and fraudulent pretenses. . . ." Ritchie was ordered to appear at a hearing in Washington on April 6, 1952, to discuss its issuance.⁷⁶

But the Bureau's report was ambiguous as to what samples of AD-X2 were used in the tests, and on March 13, 1952, the POD asked for further tests. The hearings for Ritchie were delayed four successive times to await the results. Six discarded and six new batteries were used in these tests and, aware that Ritchie and his supporters had stated that the Bureau had not tested AD-X2 by Pioneer's recommended procedure, the Bureau used the Randall Test. The results were by now predictable: "The electrical tests of 'Battery AD-X2' at this Bureau showed that the product has no beneficial effects on the performance of lead-acid storage batteries." The hearings were scheduled for October 13, 1952.⁷⁷

The FTC also needed new tests. Those performed in early 1950 had not been made on the samples of AD-X2 provided by the FTC, and hence legal traceability was lost. Thus, on February 26, 1952, the FTC asked for further tests. Reported on July 21, 1952, these were not ambiguous, and were by now an old story. Of the material provided, 99.7 percent was water soluble, consisting of 53.0 percent magnesium sulfate, 35.8 percent sodium sulfate, and 11.2 percent water of hydration. The remaining 0.3 percent was water insoluble, consisting mainly of barium sulfate with "traces of several elements which undoubtedly were impurities contained in the basic materials, sodium sulfate and magnesium sulfate." Any scientist looking at the results would say that Battery AD-X2 was a not very carefully prepared mixture of dehydrated Epsom and Glauber's salts. And the electrical tests, again using the Randall procedure, were again unambiguous. They were made on six discarded Exide XH-152 batteries, as usual maintaining one or two cells in each battery as controls. The results were again predictable: "in view of the over-all tests made in this laboratory, the Bureau fails to find evidence that the use of this material would justify the claims made. . . ." ⁷⁸

⁷⁶ To the Chief Hearing Examiner of the Post Department. "In the Matter of the Complaints That Pioneers . . . are engaged in conducting a scheme for obtaining money through the mails by means of false and fraudulent pretenses, representations and promises . . . March 18, 1952. Roy C. Frank, Solicitor.

⁷⁷ Letter, C. C. Garner, Chief Post Office Inspector, to A. V. Astin, March 13, 1952. (NARA; RG 167; Astin file; Box 11; Folder P.O. & F.T.C. re AD-X2); "Standard Test for Additives for Storage Batteries," Merle Randall, May 20, 1948. (NARA; RG 167; Astin file; Box 3; Folder AD-X2 (2)); National Bureau of Standards, "Report on Examination of AD-X2 Battery Additive Submitted by Post Office Department thru Division 1, Section 8, Project No. 0199," James I. Hoffman, Chief, Surface Chemistry Section, July 8, 1952; National Bureau of Standards, "Report of Test of 'Battery AD-X2' Battery Additive Submitted by Post Office Department, Case No. 85372-F," Walter J. Hamer, Chief, Electrochemistry Section, July 17, 1952.

During 1952 and the beginning of 1953 the Bureau was to be swamped with AD-X2 testing. From March 19, 1952, to May 4, 1953, the Bureau tested AD-X2 on 102 old batteries and 24 new ones. This involved testing 378 cells. The tests also involved physical-chemical investigations and chemical analysis. Eleven staff members were involved, including the director for one set of tests. "Resumé of Tests of AD-X2 at the National Bureau of Standards" from *Report on Battery Additives by the National Bureau of Standards*, National Bureau of Standards Report 2447, April 16, 1953.

⁷⁸ Letter, Joseph W. Powers, Federal Trade Commission, to John W. McBurney, February 26, 1952. (NARA; RG 167; Astin file; Box 11; Folder P.O. & F.T.C. re AD-X2); National Bureau of Standards, "Report on Examination of AD-X2 Battery Additive Submitted by Federal Trade Commission thru Division 1, Section 8, Project No. 0199," James I. Hoffman, Chief, Surface Chemistry Section, July 8, 1952; National Bureau of Standards, "Report of Test of 'AD-X2' Battery Additive Submitted by Federal Trade Commission," Walter J. Hamer, Chief, Electrochemistry Section, July 21, 1952.

The barium sulfate was a new result. It is insoluble in battery electrolyte and is sometimes used in negative plates to prevent contraction and solidification of the spongy lead paste. Because of its insolubility it cannot be added via the electrolyte.

Along with the POD, the FTC was also in position to institute proceedings against Pioneers.

THE SENATE SELECT COMMITTEE ON SMALL BUSINESS GETS INVOLVED

Upon receiving a letter from the POD ordering him to appear in Washington on April, 26, 1952, to answer a charge of mail fraud before a complaint was issued, Ritchie temporarily moved to Washington, taking up residence on Connecticut Avenue, not far from Bureau headquarters. It was to be a pivotal year.

His main intent was to continue the political campaign he had begun against the Bureau, but first he needed legal and scientific help. He hired a lawyer, and sought a consultant to replace Randall. He settled on Keith J. Laidler, assistant professor of chemistry at The Catholic University, a younger man but already well known in the field of chemistry for the outstanding text, *The Theory of Rate Processes*, which he had co-authored in 1941 with Samuel Glasstone and Henry Eyring while at Princeton.⁷⁹ Then Ritchie went to Boston to talk to Professor Harold C. Weber of the Massachusetts Institute of Technology. Weber had some years previously written to Pioneers for information on AD-X2. More recently he had been contacted by Norman Goodwin, President of Guaranteed Batteries of Boston and a distributor for Ritchie. Weber had become interested in battery additives and, after being contacted by Goodwin, had, on his own initiative, run some tests on Battery AD-X2. He was not retained by Ritchie, but was to play a very important part in the incident.

One of the first things Laidler did was to write a critique of Circular 504.⁸⁰ He pointed out correctly that AD-X2 had numerous satisfied customers, many of whom were experienced battery technicians who were hard to fool, but nowhere mentions the questions of controls in these testimonials. He discounted the Bureau's tests because they "were carried out on batteries that in all probability were in a mechanically unsound condition," and "in view of this the tests described do not constitute a fair or objective trial. . . ." Then he came to the conclusion that the Bureau had not really tested AD-X2 because it stated that the additives used were combinations of sodium and magnesium sulfates, whereas "AD-X2 . . . is not a simple combination of these two sulfates." No data were appended to substantiate that statement. He also went into motivations. "It is difficult to avoid the conclusion that the object of Circular No. 504 was to discourage the average reader from using battery additives by the use of highly technical arguments which would be incomprehensible to him rather than to be informative, objective and educational." Finally he wrote, "It is suggested the Bureau withdraw Circular 504 in the public interest." Laidler's critique was not a document that would endear him to the Bureau staff.

But Ritchie was in Washington primarily to bring political pressure on the Bureau, not solely to talk to scientists. He contacted both the House and Senate small business committees and got a favorable response from both, but the House committee bowed out after the Senate committee became involved. The House committee did, however, ask the Bureau to test AD-X2 on March 11, 1952,⁸¹ during the period when the Bureau was carrying out tests for the POD and the FTC. Events would conspire to make the request redundant.

⁷⁹ Samuel Glasstone, Keith J. Laidler, and Henry Eyring, *The Theory of Rate Processes* (New York: McGraw-Hill, 1941).

⁸⁰ Keith J. Laidler, "A Critique of the National Bureau of Standards Circular 504 on Battery Additives With Special Reference to 'Battery AD-X2,'" May 15, 1952. (NARA; RG 167; Astin file; Box 10; Folder Laidler)

⁸¹ Letter, Victor P. Dalmas, Select Committee on Small Business of the House of Representatives, to A. V. Astin, March 11, 1952. (NARA; RG 167; Astin file; Box 10; Folder Senate Small Business Committee)

Ritchie's greatest support came from the Senate Select Committee on Small Business (SSCSB). Formed as a permanent body with no legislative jurisdiction, the SSCSB was run with little supervision by a professional staff of six that did not change with a change of majority party in the Senate. Ritchie was referred to Blake O'Connor, one of the staff. A Harvard graduate, he had been employed by several Government agencies, including the Department of Commerce, before becoming a committee staff member. He felt that AD-X2 did work because the battery manufacturers were opposed to it, and he saw in it a test case for the committee's effectiveness. Ritchie had found his champion, and Weber of MIT agreed to become an unpaid consultant for the committee.⁸²

O'Connor asked the Bureau to test AD-X2, and for several months worked "with the National Bureau of Standards in an effort to determine the merits of . . . AD-X2."⁸³ But most important, Weber had agreed to conduct some independent tests on AD-X2 if the MIT administration would agree. O'Connor thus wrote to Julius Stratton, Provost of MIT, requesting this testing. Stratton agreed to have Weber carry out such tests, but did not agree to have MIT comment on tests carried out in other institutions. One of the Nation's most highly respected scientific institutions had entered the argument.⁸⁴

FINALLY A PUBLIC TEST

After Condon left the Bureau on September 30, 1951, Astin, while still only acting director (he was not confirmed until May 30, 1952), was in charge. He became personally involved in the AD-X2 affair, and had discussions with Secretary Charles W. Sawyer about it on his very first day. With what seemed like an endless series of requests for testing AD-X2 on his hands, Astin had to find some way to resolve the situation.⁸⁵ He determined that if the Bureau were to conduct a test using a procedure agreed to by Ritchie, the latter would have to abide by the results. Not that he lacked confidence in the Bureau's procedures. "Although I had no reason for questioning the adequacy of the test procedures the Bureau had used previously, I had hoped that by using a procedure described by him [Ritchie], the matter could be settled decisively for all concerned," he testified before the Senate.⁸⁶ It was to be a fond hope.

Indeed, getting the test under way presented some problems. Whom was the Bureau to contact: Ritchie? The Department of Commerce? The SSCSB? Ritchie himself provided the answer by arriving unannounced at Hamer's office in the company of his wife, his lawyer, and Laidler, and asking that AD-X2 be tested by his procedure. Hamer did not have the authority to make such a decision, so a conference between

⁸² Lawrence, *Battery Additive Controversy*: 12.

⁸³ Letter, B. O'Connor to J. A. Stratton, MIT Provost, October 8, 1952. (NARA; RG 167; Astin file; Box 10; Folder Pioneers Ritchie)

⁸⁴ Letters, J. A. Stratton to B. O'Connor, October 9, 1952; M. G. Kispert, Executive Assistant to J. A. Stratton, to B. O'Connor, November 6, 1952. (AD-X2 Hearings: 370)

⁸⁵ In early 1952, the Bureau had requests for tests from the POD, the FTC, the House Small Business Committee, the Senate Committee on Small Business, and Senator Richard M. Nixon, among others.

⁸⁶ A.V. Astin testimony, AD-X2 Hearings: 222.

Ritchie and Astin was arranged. Astin agreed to a test if Ritchie would provide a procedure that would also be acceptable to the Bureau, and Ritchie did provide a procedure, called by him the "suicide test." At conferences between Ritchie and the Bureau staff, modifications to the test were agreed upon. These, and the method of conducting the tests, were sent to Ritchie by Astin on May 23, 1952, for Ritchie's concurrence.⁸⁷ Half of the batteries to be used in the test were to be treated with AD-X2 and the remainder left untreated. A feature of the test was that the batteries were numbered, but would be treated at random. Only Astin was to have the key as to which were treated and which were not; the scientists carrying out the laboratory work would not know which batteries were which. "Here I believe that it is important to point out that had we put AD-X2 in all of the batteries rather than in just half of them, we would have duplicated the experience reported by most of the proponents of AD-X2," Astin later testified.⁸⁸ A further feature of the tests was that a panel of experts, including Ritchie's people, were to inspect plates removed from ten batteries—five untreated and five treated, chosen at random—after the tests, and rate their condition. Ritchie was also allowed to have an observer (not himself) during the tests. As might be expected, the panel of experts was unable to distinguish between treated and untreated plates.

Astin's letter to Ritchie contains the statement, "If the tests do not establish definitely the usefulness of your product, I will expect you to concur that it has not been possible to demonstrate the value of your product. If the tests show conclusively that your product is of value, then the Bureau's position on battery additives will have to be modified." Whatever the results, Astin expected that they would have decisive effects.

There was, however, one seemingly minor point that was to give Ritchie a loophole through which he could wriggle. This concerned a technical question on the addition of water during charging of the batteries. Ritchie required that if the specific gravity of the electrolyte rose above 1.280, acid was to be removed and replaced with water to bring the specific gravity down to 1.280. The Bureau opposed this for the following reason. The mere addition of AD-X2 to the electrolyte increased the specific gravity by a small but measurable amount. Thus, it is entirely possible that the specific gravity of the treated batteries would rise above 1.280 and so require that acid be removed and water added, while the untreated batteries would not. As a result the two sets of batteries would not have received the same treatment, and the scientific validity of the comparison would be compromised. Discussions went back and forth, and finally, just a few days before the test, a compromise was achieved—or at least so Astin thought. The limit would be raised to 1.325, and if a certain percentage of cells in a given

⁸⁷ *Report on Battery Additives by the National Bureau of Standards*, National Bureau of Standards Report 2447, April 16, 1953; "Manufacturer's 'Procedure for Testing Battery AD-X2 (Suicide Test)," NBS Report 2447, Appendix 1.1; letter, A. V. Astin to J. M. Ritchie, May 23, 1952. NBS Report 2447, Appendix 1.2; letter, J. M. Ritchie to A. V. Astin, May 26, 1952. NBS Report 2447, Appendix 1.3.

⁸⁸ A. V. Astin testimony, AD-X2 Hearings: 223.

charging line exceeded this value, acid would be removed and water added to all.⁸⁹ It seemed a minor point and nothing was in writing, but Ritchie was to claim that his instructions were not followed, and this gave him an opportunity to dispute all the results.

Under constant pressure from Ritchie to provide a report,⁹⁰ the Bureau issued one on July 11, 1952. This was followed with a list of minor mathematical corrections on September 5. AD-X2 was still not named.⁹¹ The conclusions were predictable: "The results of the . . . investigation . . . indicate that the battery additive tested has no beneficial effect on the properties or performance of batteries."

If the conclusions were predictable, so was Ritchie's reaction. He had not agreed on the specific gravity modification, and it "was not a minor deviation but was a ruinous deviation."⁹² Moreover, there were "nine other modifications of our original test procedure."⁹³ Astin's hopes of resolving the situation with a public test were dashed. Four years after it began, the battery additive incident was no closer to a resolution than it had been at the start.

MIT CONDUCTS TESTS WITH SEEMINGLY STARTLING RESULTS

Ritchie was not alone in refusing to accept the results of the Bureau's open test. He was joined by his consultant Laidler and by O'Connor of the SSCSB. O'Connor and Laidler had meetings with Astin, at which Laidler criticized the Bureau's conduct of the tests and the conclusions drawn.⁹⁴ At O'Connor's request, a large meeting was

⁸⁹ *Ibid.*, 245.

⁹⁰ Astin recounts an amusing story about Ritchie's persuasiveness. Speaking of the period during which the test was underway, he recalls, "Ritchie was in my office all the time the tests were being run and the results were being evaluated. He would sit out with Miss Kingsbury [Astin's secretary] in the outer office and chat with her. And when we finally got the results and Ritchie called me and I had to tell him that the results were not favorable to him, Miss Kingsbury said to me. 'I am sorry you had to tell him that. He is the nicest man.' He had her completely sold. He was a 'good guy.'" (Interview with A. V. Astin, July 12, 1983; NIST Oral History File)

⁹¹ National Bureau of Standards, "Test of a Battery Additive," September 5, 1952. (NARA; RG 167; Astin file; Box 9; Folder Investigations of Battery Additives at NBS)

⁹² J. M. Ritchie testimony, AD-X2 Hearings: 143.

⁹³ *Ibid.*, 148.

⁹⁴ At a meeting on July 29, 1952, upon O'Connor's departure, Astin asked Laidler to stay on. Then, according to Laidler, Astin proceeded to berate him, stating that anyone who did not believe the evidence against AD-X2 was not using sound scientific judgment. Astin also allegedly threatened to speak to Professor F. O. Rice, chairman of the Chemistry Department at Catholic University, where Laidler was an assistant professor. (Letter, K. J. Laidler to J. M. Ritchie, August 5, 1952; AD-X2 Hearings: 150) There clearly was a serious argument between the two men. Laidler's comments about Circular 504 could hardly have endeared him to Astin. Indeed, two days after the meeting, Archibald T. McPherson, associate director of the Bureau, wrote to Rice. His letter reads in part, "Mr. O'Connor of the U.S. Senate Committee on Small Business and Dr. Laidler had a long discussion with Dr. Astin yesterday regarding the Bureau's recent investigation on battery additives. In the course of the conversation, Dr. Laidler said he had no objection to our acquainting you with his activities on this subject. . . ." McPherson enclosed Laidler's critique of Circular 504, two other Laidler publications, and the Bureau's July 11 report on the public tests. He then continued, "I am bringing these documents to your attention because they point to a disagreement between a member of your University and this Bureau of so serious a nature that it is suggested that one of our publications should be withdrawn in the public interest." (Letter, A. T. McPherson to F. O. Rice, July 31, 1952)

This letter is a clear reminder that neither side in the controversy was playing softball.

convened at the Bureau on September 29, 1952. Present at the meeting were Ritchie, O'Connor, Laidler, Professor Weber of MIT, Astin, members of the Bureau staff, two representatives of the POD, and a representative of the Department of Justice. At this meeting Weber presented some preliminary tests that purported to show differences between untreated batteries and those treated with AD-X2. The Bureau agreed to try to check these results if a description of the testing procedures could be obtained. The Bureau made several attempts to obtain the procedures, but they were not made available until MIT had issued its own report in December on subsequent tests, by which time the situation had changed dramatically. Several weeks after the September 29 meeting, the Bureau was informed by O'Connor that MIT was beginning a more complete series of tests to check on its preliminary results. At the request of O'Connor, this work was to be carried out by MIT as a public service. But MIT would not evaluate the work of other groups.⁹⁵ The Bureau was invited to participate, but decided not to do so, believing that unfavorable results would be more acceptable to the proponents of AD-X2 if it did not participate. Considering what was to happen, this may have been an error.

The results were not negative. Carried out at MIT by a team of distinguished faculty members led by Weber, the work was completed in early December. A report on the work was hand-carried from MIT to O'Connor on December 16, 1952.⁹⁶ Two days later the SSCSB issued a long press release. Containing a summary of the MIT results, a long set of comments and a background statement by Laidler (now identified as a consultant to the Committee), and a supporting statement by the OBBB, the press release was bombshell. In Laidler's words from the release:

The Massachusetts Institute of Technology test, carried out at the special request of the Senate Small Business Committee, constitute[s] by far the most thorough scientific tests of the effectiveness of Battery AD-X2. They demonstrate beyond reasonable doubt that this material is in fact valuable, and give complete support to the claims of the manufacturer. They also show additional desirable effects not specifically claimed by the manufacturer.⁹⁷

⁹⁵ Letter, M. G. Kispert, Executive Assistant to J. A. Stratton, to B. O'Connor, November 6, 1952. (AD-X2 Hearings: 370)

⁹⁶ Harold C. Weber, "Some Facts Concerning the Effect of Battery Additive AD-X2 on Lead-Acid Batteries," Cambridge, Mass., December 1, 1952.

On the following day, Astin was asked by O'Connor if the Bureau would care to review the report that day in the Senate Office Building, whereupon Astin sent Hamer, accompanied by Archibald T. McPherson, associate director for chemistry, to review the report. When O'Connor asked the two men to meet with the press, they declined, stating that they would need more time for their review. The Bureau received an official copy a week later.

⁹⁷ Senate Small Business Committee press release SSB #109, December 18, 1952.

Laidler went on to castigate the Bureau in no uncertain terms. After listing alleged flaws in the NBS work, he continued, "We have seen what the technical objections to the Bureau's tests were; our present concern is how the Bureau could dare to make such grave errors." He came to the conclusion that because of their long history of work with batteries, and an implied association with battery manufacturers, "they were simply psychologically incapable of giving Battery AD-X2 a fair trial." Magnesium and sodium sulfates were ineffective? Why, of course, but could it not be that (unspecified) contaminants in AD-X2 might have had a catalytic effect? Failure to take this into account was "erroneous and reprehensible." In their stridency, Laidler's comments rivalled those he had made in his critique of Circular 504.⁹⁸

Widely reported in the press, the release left the public confused. Here were two of the Nation's most eminent laboratories arriving at diametrically opposed conclusions on such a seemingly simple thing as deciding whether a battery additive was good or bad. "NBS on the Spot," headlined *Newsweek*.⁹⁹ How could this happen?

The answer was not long in coming. Significantly, the press release omitted a comment in the MIT report by Professor James A. Beattie, a member of the MIT team. In the form of an evaluation of the results, he wrote, "In conclusion, I would say that the addition of AD-X2 certainly does have an effect on the behavior of a lead-acid battery. From my brief contact with the work, I cannot say that this effect is correlated with a beneficial action from the standpoint of the normal use of such a battery." In fact, the MIT report made no evaluation of the results. In his covering letter to the report, Stratton wrote, "I would point out . . . there are no recommendations included in the report, nor did our group arrive at any definitive conclusions with respect to the commercial value of the product."¹⁰⁰ The Bureau was soon to quantify this matter.

Immediately upon receiving the MIT report, the Bureau set out to check the MIT results, and reported its findings in a report, "Statement on Battery Additives" to the House Interstate and Foreign Commerce Committee, which had jurisdiction over the Bureau.¹⁰¹ It was immediately apparent that the MIT work dealt with very dilute acid solutions found only in discharged or nearly discharged batteries, and the Bureau could confirm only one finding out of eight: the so-called "bubble effect," in which treated cells formed much smaller bubbles on charging than untreated cells. Even this effect was noticeable only at such low acid concentration and slow charging rates that it was unimportant in normal operation, such as in automobiles. Contrary to the MIT results,

⁹⁸ Laidler was to claim that he did not write the portion of the analysis beginning with the phrase, "our present concern is how the Bureau could dare to make such grave errors." (Lawrence, *Battery Additive Controversy*: 17)

⁹⁹ *Newsweek*, December 22, 1952: 53.

¹⁰⁰ Letter, J. A. Stratton to B. O'Connor, December 16, 1952.

¹⁰¹ U.S. Department of Commerce, National Bureau of Standards, "Statement on Battery Additives, prepared for the Committee on Interstate and Foreign Commerce, U.S. House of Representatives," February 10, 1953.

the Bureau did not find that batteries with low acid concentrations operated at lower temperatures than untreated batteries, nor did they find that AD-X2 increased electrical capacity or charging efficiency. Moreover, mixtures of magnesium and sodium sulfates showed the same behavior as AD-X2, effectively demolishing Laidler's "catalytic impurity" hypothesis. Battery AD-X2 was still a not-very-well-controlled mixture of sodium and magnesium sulfates. By working with a very dilute electrolyte, MIT had uncovered one minor positive effect, but it was of academic interest only and had nothing to do with the normal operation of batteries such as operating a car.¹⁰²

THE POST OFFICE DEPARTMENT TAKES ACTION

In the fall of 1952, its own tests at the Bureau being complete, and the results of the Bureau's public test now being available, the Post Office scheduled its oft-delayed fraud hearings for October 13 and 14.¹⁰³ Allen Astin and seven Bureau scientists testified, but Ritchie did not.¹⁰⁴

Ritchie had, in fact, returned to California shortly before the hearings were to begin. Oddly, he fired his lawyers, which caused him some problems, for he did not know the laws that governed hearings such as the one being held. He did not recognize, for example, that affidavits submitted on his behalf were not admissible as evidence unless the person giving the affidavit was present at the hearing to present it, although the hearing examiner could take it into account in arriving at a decision. In fact, W. C. O'Brien, assistant solicitor for the POD, pointed out some of the points of law to Ritchie. According to O'Brien's statement at the POD hearings, Ritchie had decided as early as October 1 to forego the hearings, figuring eventually to bring suit in court should they result in a judgment against him. O'Brien pointed out to him that he could not do this, for a court would require that he had exhausted his administrative remedies before taking the case to court, and this hearing was clearly such a remedy. Indeed, O'Brien offered to him the option of giving up his mail order business (which was less than 1 percent of Ritchie's business) whereupon the POD action against him would be dropped. Ritchie refused, and the hearings went on.¹⁰⁵

¹⁰² The Bureau went beyond simply checking the MIT results. In tests designed to obtain further supplementary information, it was found that AD-X2 had a slightly detrimental effect in some tests. The tests showed that AD-X2 slightly retarded the charging of negative plates, it increased the resistivity of the electrolyte except for very dilute electrolytes outside the range of normal battery operation, and it increased the viscosity of the electrolyte. These detrimental effects, however, "are so small . . . that . . . they can be discarded or not considered. . . . [I]f it were on the helpful side rather than the hindering side we would not consider it even then of sufficient importance to be considered as beneficial." (A. V. Astin testimony, AD-X2 Hearings: 319) Further details are in NBS Report 2447.

¹⁰³ "Before a Hearing Examiner for the Post Office Department, Holding a Fraud Order Hearing, In the Matter of Pioneers, Inc., at Oakland, California. Transcript of Proceedings, October 13, 14, 1952, Washington, D.C." A good account is also given in Lawrence, *Battery Additive Controversy*.

¹⁰⁴ The scientists were Hymin J. Feinstein, James I. Hoffman, and Bourdon F. Scribner of the Chemistry Division; D. Norman Craig, Clarence L. Snyder, and Walter J. Hamer of the Electrochemistry Section; and Churchill Eisenhart of the Statistical Engineering Laboratory.

¹⁰⁵ W. C. O'Brien testimony, POD Hearings: 4.

With only one side participating, the hearings were rather routine. The Bureau people explained their results and answered the questions of the solicitors and the examiner, sometimes in great detail. But two comments by Astin toward the end of the hearings were particularly interesting in that they illustrated the Bureau's feeling in the matter at this time. When asked about testimonials, Astin answered without equivocation: "Nobody else has run a controlled experiment. And in the absence of any controlled experiment showing the merit of the battery additive I find it difficult to give any weight to any of the testimonials."¹⁰⁶ His personal feelings are well illustrated by his comments about Weber's position at the September 29 meeting that preceded the MIT experiments. Astin testified, "During the course of this meeting, Dr. Weber seemed to give considerable more credence to the scientific conclusions which he attempted to draw from the experiences of battery service men than he did from the observation of our organization, and any man who does that, I would question his scientific conclusion."¹⁰⁷ There was little doubt about where Astin, and hence the Bureau, stood on the AD-X2 matter.

Early in 1953, Ritchie tried to get the POD to reopen his case.¹⁰⁸ With the help of O'Brien and O'Connor of the SSCSB, he filed an "Application for Correction of Default." It was denied. Ritchie had defaulted deliberately, the examiner found, and the MIT tests and Laidler's comments, which Ritchie had quoted in his application, did not "go to establish the validity of the respondent's advertising claims." On February 24, 1953, Ritchie's mail was stopped and returned to the sender marked "Fraudulent." If maintained, the order would be a great blow to his business.

The order did not last long.¹⁰⁹ The political process was quick to restore Ritchie's standing.

THE BEGINNING OF THE RESOLUTION

By early 1953 it had become clear that the AD-X2 incident would never be resolved in the scientific arena. The proponents of the additive, led by Ritchie and with Laidler as point man on scientific questions, would not accept any result that did not show that their product was valuable and did all that they claimed. The Bureau, confident that its experiments had been designed and carried out by the world's foremost experts, was not about to change its conclusion that AD-X2 was ineffective. Nor was it about to carry out field tests. These were not called for, it believed, for the laboratory tests gave no reason to expect that field tests would suddenly prove AD-X2 to be meritorious. Moreover, field tests were expensive, and neither of the Bureau's clients—the FTC and the POD—had specifically asked for them. And, one presumes, there was the definite

¹⁰⁶ A. V. Astin testimony, POD Hearings: 92.

¹⁰⁷ *Ibid.*, 93.

¹⁰⁸ Lawrence, *Battery Additive Controversy*: 19.

¹⁰⁹ Post Office Department Press Release No. 977, August 20, 1953.

feeling that even if the field tests also showed the material to be without merit, the AD-X2 proponents would find yet other reasons not to accept the test results. It seemed that a complete impasse had been reached.

In an unusual twist, the impasse was to be ended, if not resolved, from a most unexpected quarter: the change in administration that came with the 1952 presidential elections. And that the ending should occur in an almost bizarre way seems fitting for this strange, convoluted affair.

Running on an anti-New Deal, pro-business, anti-corruption, anti-Communism platform, and featuring a pledge to end the Korean conflict, the Republican Eisenhower-Nixon ticket rode roughshod over the Stevenson-Sparkman Democrats, winning the White House as well as both houses of Congress. A changed philosophy of Government had been installed in Washington, one best exemplified by the nomination as secretary of defense of Charles ("Engine Charlie") Wilson, president of General Motors, whose statement, "What's good for the country is good for General Motors and vice versa," was added to the lexicon of the Nation's political history.

Equally emblematic of the changed philosophy was the appointment of Sinclair Weeks as secretary of commerce. A Harvard graduate, banker, businessman, ex-president of the National Association of Manufacturers, and son of John W. Weeks, secretary of war in the Harding and Coolidge administrations, Weeks came into office promising "to create a 'business climate' in the nation's economy." In Goldman's words, he was to express "the new order of things . . . in a form so extreme that it amounted to a caricature."¹¹⁰

As soon as he learned in December 1953 that Weeks had been appointed secretary of commerce, and hence overseer of the Bureau, Ritchie and his distributors began another writing campaign. Weeks' mail was filled with material about the merits of AD-X2, and the difficulties the manufacturer and distributors were having with the Bureau. By sheer coincidence, one of the companies of which Weeks was a director had a battery that was presumably "used up," and had bought a replacement battery for \$1300. But after being worked on by "these battery AD-X2 people" the old battery was revived, and was still working after thirteen months. The new battery was "standing in the corner."¹¹¹ Lady Luck had smiled on Ritchie.

When Weeks took office, he installed his own people at the assistant secretary level, and got rid of 1330 others as an economy measure.¹¹² As assistant secretary for domestic affairs he appointed Craig R. Sheaffer, a former president of the Sheaffer Pen Company.¹¹³ Sheaffer's position gave him supervisory authority over the Bureau, and Weeks asked him to investigate the AD-X2 matter. Ritchie worked closely with Sheaffer in the investigation.

¹¹⁰ Eric F. Goldman, *The Crucial Decade—and After: America, 1945-1960* (New York: Vintage Books, 1960): 241-242.

¹¹¹ Secretary Sinclair Weeks testimony, AD-X2 Hearings: 4.

¹¹² Lawrence, *Battery Additive Controversy*: 18.

¹¹³ Newspaper accounts alleged that Sheaffer was upset with the Government because of an FTC investigation of the Sheaffer "lifetime" pen, and with the Bureau for "high-handed" testing of a pen. (Lawrence, *Battery Additive Controversy*: 19) The Bureau never tested a Sheaffer pen. (Interview with A. V. Astin, July 12, 1983; NIST Oral History File)

Astin tried to see Weeks, but his efforts were to prove fruitless. Indeed, recognizing that the Department did not, in Astin's words, have "confidence in the adequacy of the Bureau's work on battery additives," he urged Weeks in writing to enlist the assistance of the Bureau's Visiting Committee and the National Academy of Sciences to form two committees, one to study the Bureau's operations, and another to study the accuracy of the Bureau's scientific work. Astin never heard from Weeks, but his proposal was to be implemented in a manner he could hardly have expected.

One of the first things that happened after Weeks took office was the rescinding of the POD fraud order. With a new leadership in Congress, the chairman of the Senate Small Business Committee was now Edward J. Thye of Minnesota, but the professional staff had not changed. Ritchie, with the help of O'Connor, persuaded Thye to help him on the POD fraud order, and Thye provided a supportive letter of transmittal for a petition Ritchie had written for delivery to Postmaster General Arthur Summerfield. Weeks, in turn, also provided a request that the fraud order be rescinded, and the documents were delivered to Summerfield at his home on Friday, February 27. Following a morning conference among Summerfield, Weeks, and Sheaffer and their top aides, Summerfield approved Ritchie's request and suspended—but did not repeal—the fraud order. It had lasted three days. Ritchie could receive mail again and was back in business.

Sheaffer's investigation continued. Investigators from the Department of Commerce went meticulously through the Bureau files. The Bureau, following its normal course of operation, prepared the "Statement on Battery Additives"¹¹⁴ for the House Interstate and Foreign Commerce Committee and submitted it without notifying Sheaffer that it was doing so. Furious, Sheaffer ordered that further copies be impounded and, in response to an inquiry about AD-X2, wrote to a trade journal:

The new administration officials of the Department of Commerce report that they have not had time to complete their study of the question of battery additives. Therefore, they have not yet made a final decision as to their attitude on previous opinions of the National Bureau of Standards on the value of such additives.

In fact, on March 4, 1953, Sheaffer ordered that all dissemination of information on battery additives by the Bureau be halted. From then on a form letter containing the following statement was sent to anyone (except agencies of the Government) requesting information on battery additives, "The Department of Commerce is currently studying the battery additive matter and pending the completion of their study, the National Bureau of Standards is not disseminating any information on the subject."¹¹⁵

¹¹⁴ National Bureau of Standards, "Statement on Battery Additives, Prepared for the Committee on Interstate and Foreign Commerce, U.S. House of Representatives," February 10, 1953.

¹¹⁵ NARA; RG 167; Astin file; Box 6; Folder Battery Additive 1953. Indeed, within a few days of the Sheaffer order, Jesse L. Mathusa, who was in charge of Bureau publications, received a call from the Commerce publications chief. He was told to burn all copies of Circular 504, but they settled for impoundment. In addition, Raymond Davis, chief of the Bureau's Photographic Laboratory, made a photographic copy of the data on which Circular 504 was based to assure its retention.

Sheaffer was rapidly making up his mind. He became convinced that the Bureau had mishandled the AD-X2 affair. He was convinced by the testimonials and the large number of satisfied users that AD-X2 was a worthwhile commodity and that Ritchie had been unfairly prevented from selling it. A massive Government had prevented a small businessman from making a living. This was just the type of unfair treatment that both Weeks and Sheaffer had come to Washington to prevent. Sheaffer recommended that Astin be fired.¹¹⁶

ASTIN IS FIRED AND WEEKS LEARNS THE WAYS OF WASHINGTON

Despite the fact that the director of the Bureau was a civil servant, he, and others like him in similar positions in the bureaucracy, served at the pleasure of the president. Civil service rules did not apply to these positions. Thus, it was not uncommon that the holder of such an office be asked to resign at a change of administration. But at the National Bureau of Standards this had never happened; the position of director was considered to be a professional, not political, position. Astin was the first Bureau director whose resignation was requested.

After receiving the recommendation from Sheaffer, and discussing the whole case with the top-ranking officials in his administration (but not Astin), Weeks agreed with Sheaffer. It was, however, by no means a decision agreed to unanimously by Weeks' staff—Sheaffer was its main proponent.¹¹⁷ Nor is it clear that Weeks was aware of the nature of Astin's position. It seems, in fact, that Weeks considered the firing not much different from the type of house-cleaning he had carried out with the political staff, and Astin appears to have considered it in this light as well. Whatever the facts, the decision was made. On March 24, 1953, Astin was called into Sheaffer's office and told that the secretary desired his resignation "in order to study and make changes in the operations of the National Bureau of Standards."¹¹⁸ In his statement on resigning, Astin said, "When Mr. Sheaffer informed me that the Secretary desired my resignation, I felt I had no alternative to submitting it. Unless the Director of the National Bureau of Standards has the full support and cooperation of the Secretary of Commerce, the effectiveness of the important services which the National Bureau of Standards renders to science, industry, and government would be seriously impaired." On March 30, his short resignation letter was sent to the president, and two days later President Eisenhower accepted it, effective April 18.

¹¹⁶ Lawrence, *Battery Additive Controversy*: p. 20.

¹¹⁷ The main supporter of Astin was Assistant Secretary for Administration James C. Worthy. He tried to stop Astin's firing but was unsuccessful. Only a few months later, Worthy was to replace Sheaffer as Astin's immediate superior. (Herman Wolkinson, "Memorandum of a Phone Conversation with James C. Worthy on November 25, 1959." NARA; RG 167; Astin file; Box 7; Folder untitled [legal size]. Wolkinson was a senior trial attorney for the Department of Justice)

¹¹⁸ Statement on Resignation by Dr. A. V. Astin, Director, National Bureau of Standards, April 1, 1953, 5:30 p.m. (NARA; RG 167; Astin file; Box 6; Folder 0/9.46 Battery Additives)

Again with almost miraculous coincidence, the SSCSB had scheduled hearings for Weeks alone on the afternoon of March 31, 1953. In that morning's *Washington Post* and 300 other newspapers throughout the country, a column by Drew Pearson entitled "Astin Ouster Laid to Influence" appeared. It read, in part:

Dr. A. V. Astin, Director of the National Bureau of Standards . . . has been trying for several weeks to get an appointment with his chief, the new Secretary of Commerce, Sinclair Weeks. As the head of one of the non-political, scientific bureaus of Government, he wanted to discuss future problems.

Secretary Weeks, however, did not see him. But last week, Dr. Astin suddenly was summoned . . . by Assistant Secretary Craig Sheaffer, head of the fountain pen company, and was fired. He was asked to turn in his resignation within three days.

He also was lectured regarding the Bureau of Standards' diagnosis of battery additives. . . . Sheaffer didn't like this diagnosis and told Dr. Astin the Bureau of Standards in the future was to be run on a businessman's basis.¹¹⁹

That very afternoon, Weeks, accompanied by Sheaffer, testified before the SSBC. The session lasted only thirty-five minutes, but, coupled with the Pearson column and the announcement of Astin's dismissal, it was to make a far longer-lasting impression on the Nation. In his prepared testimony, Weeks gave a short account of the history of the AD-X2 affair. As expected, it was quite sympathetic to Ritchie. Then Weeks quite accurately put his finger on the heart of the matter with respect to the Bureau's position on situations of this kind:

The Bureau, which is supposed neither to approve nor condemn a product, has, by its very setup, the power to make the introduction of a new product on the market very difficult, to prevent a product's being advertised by the Federal Trade Commission action, and have people labeled "fraud" and denied the use of the mails. If this power is objectively and correctly used, it has great value to all the people of this Nation. However, if the Bureau's foot slips, a business starting in against all the normal competitive hazards, finds itself up against something with which it cannot cope, the vast power of the United States Government. Unless the small-business man knows a very great deal about Government, or has the finances to employ experts, he is obliged to quit.

I cannot bring myself to believe that the people making AD-X2 have the intent to defraud—and without intent, I do not see how there can be fraud.¹²⁰

Despite the fact that Weeks rather clearly believed that the Bureau's "foot had slipped" in the AD-X2 matter, as an analysis of the Bureau's position and power in such matters the statement was largely accurate. He made three promises: To "get the

¹¹⁹ Drew Pearson, "Astin Ouster Laid to Influence," *Washington Post*, March 31, 1953.

¹²⁰ Weeks testimony, AD-X2 Hearings: 3.

best brains I can to examine into the functions and objectives of the Bureau of Standards; . . . ” to re-test AD-X2, including field tests; and to withdraw “Circular 504 and all other circulars and technical reports dealing with battery additives until such time as those tests are completed.” He was to carry out the first and third of these promises.¹²¹

Had he left the matter there, his testimony would have been important enough, but he included another statement which, coupled with the Astin dismissal, was to bring the wrath of the scientific community and a large portion of the press down on his shoulders:

I am not a man of science, and I do not wish to enter into a technical discussion or be accused of overruling the findings of any laboratory. But as a practical man, I think that the National Bureau of Standards has not been sufficiently objective, because they discount entirely the play of the market place. . . .¹²²

Widely interpreted as meaning that science should come up with results that are politically acceptable, this comment, coupled with Astin’s dismissal, unleashed a storm of criticism on Weeks. Editorials appeared almost immediately in the *Washington Post*, *The Washington Times*, *The New York Times*, and *The Los Angeles Times*. Other papers followed. “The public has a right to know whether there is any plan to mix politics with the scientific objectives of the NBS,” wrote the *Post*. “Now the new administration chops off the head of the top man in a bureau whose effectiveness depends on its freedom from accountability to any other standard than scientific integrity,” wrote the *Pittsburgh Post-Gazette*. Political cartoonists had a field day. Congressional reaction was generally unfavorable. “If this is the only incident, it is a pretty stiff penalty,” said Senator John Sparkman. Senator Wallace F. Bennett commented that the additive problem “has been handled in such a way as to injure [Astin] and the Commerce Department.” Further criticism came from private citizens and other segments of the population, but the most serious was from scientists and scientific organizations. The Federation of American Scientists led the way with a statement issued by their Executive Committee on April 4. “Resentment and apprehension have been aroused not only by the injustice done a respected colleague, but by a shadow thrown on the working relationship between science and government.”¹²³ The

¹²¹ *Ibid.*, 4. On April 7, 1953, Sheaffer strengthened his ban on the distribution of publications on battery additives. The Bureau was directed to “withhold from issue and distribution Circular 504 and all other technical reports dealing with battery additives.” (*Washington Star*, April 11, 1953). All such material was collected and stored in the attic of the South Building. As well as can be determined, this ban was never lifted. (W. R. Tilley, private communication.)

In addition, the Department of Commerce issued an order requiring its review of “proposed new publications projects.” The Bureau staff was notified by Wallace R. Brode, chairman of the Bureau’s Editorial Committee, on April 8, 1953, that “each Division’s program involving the preparation of manuscripts for issuance as NBS Circulars, Handbooks, Applied Mathematics Series, Building and Structure Reports, and Miscellaneous Publications must receive this advance approval.”

¹²² *Ibid.*, 3.

¹²³ Federation of American Scientists, Executive Committee, “Text of Statement on Dismissal of Dr. Astin,” April 4, 1953. (NARA; RG 167; Astin file; Box 6; Folder 0/9.46 Battery Additives)



Sinclair Weeks, secretary of commerce from 1953 to 1958, accused NBS of not being "sufficiently objective" in the AD-X2 matter "because they discount entirely the play of the market place. . . ." Weeks would eventually prove to be a great ally of the Bureau. (AP-Wide World Photos)

prestigious American Physical Society followed on April 8 with a statement from its executive committee: "Rightly or wrongly, the impression has got abroad that the resignation was forced for political or arbitrary reasons. Such an impression, unless corrected, will greatly impair the morale of scientists now working for the government and will make it increasingly difficult to draw other scientists into careers in government service. . . ." "Astin Ouster Assailed in West," ran the headline on a story about the reaction of West-Coast scientists in the *Christian Science Monitor*, which was otherwise one of the few papers that did not criticize the Astin dismissal. Even the august *Fortune* published a two-page factual article on the dismissal.

The Bureau staff itself was dumbfounded. While many had been aware of the AD-X2 problem before Astin's firing, and had been deeply concerned about it, after the dismissal the staff became a seething ferment. They could not believe that their gentle and highly respected director could have been summarily fired. As many as 400 threatened to quit if the situation did not change, including, as usual, some of the brightest and best, for they had plenty of offers from other organizations. The situation was particularly acute in the ordnance divisions, prompting W. S. Hinman, Jr., associate director for ordnance, to write to Wallace R. Brode, acting director after Astin's firing. Hinman wrote:

The dismissal of Dr. Astin and the AD-X2 controversy place the entire Ordnance Program of the National Bureau of Standards in extreme jeopardy.

"Go Away, Boy — You Bother Me"



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"Yes, I'm Getting Quite A Charge Out Of It"



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HERE'S MUD IN YOUR EYE!



Happy Days!

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New Battery Additive

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The high profile of the AD-X2 affair kept the cartoonists in Washington, D.C. supplied with material for their graphical observations on the political events of the day.

In one area alone, any disturbance will set back the multi-billion dollar guided missile program of the Nation, and loss of personnel would be a major catastrophe. . . .

Ever since the first news release on AD-X2, I, together with the Chiefs of the Ordnance Divisions, have paid close attention to the temper of the Ordnance Staff. We have concluded that unless the whole matter is resolved fairly and openly, the staff will accept the frequent very-high-salary offers of industry and the Ordnance Divisions will become completely impotent in less than a year.¹²⁴

Suddenly, AD-X2 threatened to become linked to national security.

Senator Thyne promised to hold hearings before the Senate Small Business Committee so that Astin could have his say. Hearings were eventually held on June 22-26, but Astin's dismissal was barely mentioned.

THE VISITING COMMITTEE

Now the Bureau's Visiting Committee was drawn into the action.¹²⁵ As he had promised in his testimony, Weeks promptly set about to form a committee to "evaluate the present functions and operations of the Bureau of Standards in relation to the present national needs." He immediately had a two-hour conference with Detlev W. Bronk, president of the National Academy of Sciences, and Mervin J. Kelly, president of the Bell Telephone Laboratories.¹²⁶ Both men were members of the Visiting Committee. Following that conference, on April 3, 1953, just three days after testifying, Weeks sent a telegram to seven scientific societies asking each to nominate a person to serve on the proposed evaluation committee.¹²⁷ Bronk had nominated Kelly to serve as chairman of the new committee. In due course, the committee would be formed, but only after some considerable drama.

Oddly enough, only Kelly had knowledge of Astin's ouster before reading about it in the public press. How much this affected subsequent events is not known, but it

¹²⁴ Memorandum, W. S. Hinman to W. R. Brode, April 13, 1953. (NARA; RG 167; Astin file; Box 6; Folder Battery Dopes, Decoy Letters??)

¹²⁵ Provided for in the Bureau's enabling legislation, the Visiting Committee reviews the Bureau yearly, and reports to the secretary on "the efficiency of its scientific work and the condition of its equipment." (Act of 22 July 1950, *U.S. Statutes at Large*, 64 (1950): 371) The Committee is formed of distinguished scientists and scientist-administrators. In April 1953 the members were: Robert F. Mehl, Carnegie Institute of Technology, chairman; Detlev W. Bronk, president of The Johns Hopkins University and president of the National Academy of Sciences; Mervin J. Kelly, president, Bell Telephone Laboratories; Donald H. Menzel, Harvard Observatory; and J. H. Van Vleck, Harvard University.

¹²⁶ Federation of American Scientists, *FAS Newsletter*, April 4, 1953, quoting the *New York Times*, April 4, 1953. (NARA; RG 167; Astin file; Box 6; Folder 0/9.46 Battery Additive)

¹²⁷ The societies were: the American Institute of Physics, American Institute of Electrical Engineers, American Society of Mechanical Engineers, American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Chemical Society, and Institute of Radio Engineers. *Physics Today* 6, no. 5 (May 1953): 21.

is bound to have had some effect. Whether the members of the Visiting Committee notified Astin about the developments is also not known, but it seems likely that ordinary courtesy would have led a member of the Visiting Committee to inform Astin of the turn of events.

So far Weeks had not met with the full Visiting Committee, and a meeting was scheduled for April 14, just four days before Astin's resignation would become effective. The committee was unhappy with the turn of events. Indeed, on that morning, "Weeks received a stiff letter from Dr. Bronk in which, for the first time, it was suggested that Weeks countermand the dismissal of Astin 'at least' until the issues could be fully studied. . . . [T]he integrity of scientific effort and the national interest demanded that Astin's departure be postponed."¹²⁸ And Weeks also wanted the Academy to form another committee to study how the Bureau had dealt with AD-X2. Bronk, president of the National Academy, refused to accept this responsibility unless Astin were retained on a temporary basis.

With the two committees hanging in the balance, Weeks could do little except accede to Bronk's and the Visiting Committee's request. On April 17, one day before Astin's resignation was to become effective, Weeks announced that Astin would remain as director until the matter was cleared up. Weeks pointed out clearly that Astin was not rehired. "No question is involved of Dr. Astin's permanent retention," he emphasized. Astin's was to be essentially a resignation, but without an effective date. Stating that his difference with Astin arose from a "conflict with respect to administrative viewpoint and procedure," he said that his actions were not intended to "cast reflection on the integrity of the Bureau or on the professional competence or integrity of Dr. Astin." Weeks' announcement was further softened by his promise that Astin would be offered a job at his present grade in the Government "where his abilities . . . may be utilized in the national interest." Astin, in turn, accepted his position "regardless of my personal opinions or wishes," despite the fact that he could not act officially as director.¹²⁹ A lull had been brought into the turbulent situation.

Reported nationwide, the announcement was viewed as a notable retreat for Weeks, and as a great victory for the scientific establishment. The scientific community was, however, more restrained. For them, the matter was not closed. Astin was still in an ill-defined situation, and the position of science in the Government needed to be clarified. "More is needed to undo the harm that has been done," stated the Council of the American Physical Society, and David Hill, chairman of the Federation of American Scientists, announced in a press release, "Until it is made clear . . . that . . . [subordination of scientific activities to non-scientific pressures] is not operative . . . the damage resulting from the Astin affair will continue to spread."¹³⁰

¹²⁸ Lawrence, *Battery Additive Controversy*: 24.

¹²⁹ Federation of American Scientists, "Statement by Secretary of Commerce Sinclair Weeks, April 17, 1953," *FAS Newsletter*, April 17, 1953; Federation of American Scientists, "Statement by Dr. A. V. Astin, April 17, 1953," *FAS Newsletter*, April 17, 1953. (NARA; RG 167; Astin file; Box 6; Folder 0/946 Battery Additives)

¹³⁰ David L. Hill, "Statement on Postponement of Astin Dismissal." Federation of American Scientists, press release, Saturday, April 18, 1953. (NARA; RG 167; Astin file; Box 6; Folder 0/9.46 Battery Additives)

THE SENATE HEARINGS

On Monday, June 22, 1953, the Senate Select Committee on Small Business recommenced the hearings that had been held in abeyance during the public uproar following the appearance of Weeks and Sheaffer on March 31. They were to last through June 26. The principal testifiers were Ritchie, Astin, and Weber, but twelve other witnesses—six of whom were from military installations, and all but one of whom were proponents of AD-X2—testified. In his opening statement on the second day of the hearings, Senator Thye stated the purpose of the hearings:

The issue which we are trying to resolve in the interest of the business, the Government, and the economy of our Nation can be simply stated. That issue is whether or not agencies of the Government have been fair and just in the treatment of Mr. Ritchie and his product, Battery AD-X2. . . .

[W]e sincerely hope that a complete presentation of the facts . . . will assist the public, the agencies of the Government, and this committee to solve the issues as I have stated them.¹³¹

No such solution was ever to be achieved by the committee. Thye went on to point out that there was a suspended fraud order against Ritchie, and “[t]his order in fairness to all parties, should not be allowed to be held in abeyance indefinitely.”

The first witness to testify was Ritchie. A voluble, somewhat rambling witness, he testified for more than five hours, running into Tuesday afternoon. Before a generally friendly committee, he gave his account of the history of the incident, and particularly his problems with the Bureau: how he got into the battery additive business; his discovery with Randall of AD-X2; how he had slowly built up his business; the large numbers of satisfied customers; the effect of Letter Circular 302, Circular 504, and the bulletins of the NBBB based on Bureau statements; his difficulty in getting the Bureau to test his product while all the time lumping it with all others for condemnation; the blunders the Bureau made when it did test it; and the disastrous effect Bureau publications had on his business. With a great deal of participation from many of the senators, it was effective testimony.

Not every senator, however, was completely friendly. In particular, Hubert Humphrey of Minnesota, who was trained as a pharmacist and hence knew chemistry, caused Ritchie some problems when discussing the composition of AD-X2 and its progenitor, Protecto-Charge. An almost humorous exchange occurred near the beginning of the testimony:¹³²

SENATOR HUMPHREY: (ostensibly quoting from the original Randall letter to Vinal) “Its [Protecto Charge] composition is a mixture of anhydrous sodium sulfate, commonly known as glauber salt, and slightly basic, nearly anhydrous magnesium sulfate, epsom salt.”¹³³

¹³¹ AD-X2 Hearings: 9.

¹³² J. M. Ritchie testimony, AD-X2 Hearings: 21-27.

¹³³ This sentence does not appear in the Randall letter.



On June 22, 1953, Jess M. Ritchie demonstrated AD-X2 before the Senate Select Committee on Small Business. (AP-Wide World Photos)

MR. RITCHIE: You are quoting Dr. Randall?

SENATOR HUMPHREY: I surely am.

And, after two more questions:

MR. RITCHIE: Senator, Dr. Randall never wrote "epsom salt" and "glauber salt" in any letter to anyone, I am sure.

SENATOR HUMPHREY: He wrote "anhydrous sodium sulfate" and "anhydrous magnesium sulfate." Anybody who has had the first year of college chemistry knows that one of those is glauber salt and one is epsom salt. One of them you give to horses and one to people; that is right, is it not?"

MR. RITCHIE: I am not a veterinarian.

SENATOR HUMPHREY: I have taken chemistry. I am a pharmacist. Now, I happen to know that you give glauber salt to animals and epsom salt to people. One is magnesium sulfate and one is sodium sulfate. Everybody knows that.

The exchange continued and developed into a question of impurities, trace elements, and secret ingredients in AD-X2.

MR. RITCHIE: The salts in this material do not appear as epsom salt or glauber salt.

SENATOR HUMPHREY: It is anhydrous sodium sulfate.

MR. RITCHIE: Slightly basic.

SENATOR HUMPHREY: That means that it has slight traces of impurities.

MR. RITCHIE: That is the key to the thing.

And a little later:

MR. RITCHIE: Now these impurities, these trace elements that are in battery AD-X2—

SENATOR HUMPHREY: What do you mean by “trace elements” that are supposed to have some peculiarities of bringing back electrical or new powers to a battery? What are these trace elements?

MR. RITCHIE: There are a number of things. There is silver, some that are added—

SENATOR HUMPHREY: Do you have a list of the trace elements?

MR. RITCHIE: I would rather not disclose them, Senator, because I believe that no man has a right to give away a secret formula.

And despite intense further questioning by Humphrey, who pointed out that any skilled chemist could identify all the trace elements, Ritchie would disclose no more on the topic of secret ingredients. Ritchie had portrayed himself as the backyard inventor who had discovered a miracle formula and was not about to divulge it. It was a skillful performance.

Ritchie was followed by Astin on the witness stand.¹³⁴ His appearance, lasting about eight hours, began with a long prepared statement that occupied almost twenty pages in the hearings transcript. In it Astin laid out the functions and activities of the Bureau and how they arose from its enabling legislation. He described how small the part commodity testing was in the whole program, and how the enabling legislation authorized the publication of material of interest to the general public. He then described the Bureau’s testing program and the development of test methods, the essential role of controls when determining the effect of “some modification in the treatment or handling process on the behavior characteristics of the material or device under investigation.” He went into field tests in the development of new ordnance devices (where the Bureau, and Astin personally, had great experience), pointing out that “the field test . . . is not resorted to until some improvement or effect is developed in the laboratory which would . . . make the field tests worthwhile.” He then recounted the Bureau’s version of the AD-X2 affair, from the receipt of Randall’s first letter through the MIT tests and the Bureau’s rationalization of those results. With respect to the Bureau’s permission to have the NBBB publish Bureau statements making specific reference to AD-X2, Astin testified, “This deviation from the usual practice was at the request of the National Better Business Bureau in order to reply to statements made by the proponents of AD-X2 that the generalization made in prior

¹³⁴ A. V. Astin testimony, AD-X2 Hearings: 214-221.

bulletins did not apply to that product and that it had not been tested by the Bureau,” and a little later, “every action which the Bureau has taken with respect to the testing of AD-X2 and the dissemination of information with respect thereto has been brought about as a direct consequence of the representations and pressures of the proponents of AD-X2.”

In his prepared testimony, Astin addressed the question of the publication of scientific results:

A laboratory study on the properties of aluminum under a particular set of environmental conditions might disclose characteristics for aluminum superior to those of steel under the same set of environmental conditions. The publication of such data would not be considered as prejudicial to those interested in promoting the use of steel; rather the withholding of such data would be considered prejudicial to the interests of the general public and those interested in promoting the use of aluminum. In science and technology a specific, reproducible observation is a fact that knows no favorites.

The statement appears to be a reply to Weeks’ “play of the marketplace” before the committee. Clearly, Astin saw the function of science as the discovery and dissemination of scientific truth, with no regard for political or other consequences. Science did not make policy; that was left to others, which might include scientists. But scientific truth was inviolate. In the AD-X2 affair, one of the first times that the paths of science and public policy crossed, things seemed relatively simple. In later years and in other settings, the discovery of scientific truth would not seem so easy.

Astin did not lack for cross-examination.¹³⁵ He was grilled about the letters to the NBBB which seemed to ask the NBBB’s advice on what to publish, and perhaps even suggesting that the FTC be brought into the AD-X2 matter; about the Bureau’s relations with industry; and about the Bureau furnishing information, in which the name of AD-X2 was used, to the NBBB and permitting them to make the information public. But foremost was the topic that concerned the whole Committee—how there could be so many satisfied users of AD-X2 and the Bureau not find merit in it. Chairman Thye returned to it several times. A typical exchange went as follows:

CHAIRMAN THYE: But the simple truth of the question is that if a good, hard-fisted businessman has used the product in a fleet of motors and in the batteries serving those motors over a number of years and is fool enough to come up and place orders month after month, what is the matter with him? Or otherwise, what is the matter with the Bureau of Standards test?

Now, that is the question, sir.

DR. ASTIN: The man with his fleet of cars might have some real data to debate on if over a rather long period of time he put the material in half the batteries of his fleet and took pains to make sure that each half of the fleet had roughly the same use conditions, and then checked them monthly. On that basis, it would mean something.

¹³⁵ Ibid., 227-332.

Many such exchanges occurred with Thye and other senators, with Astin always iterating that results without controls meant nothing, scientifically speaking, but it was not clear that he convinced any of the skeptical senators. The gulf separating the scientific and political arenas was not easily bridged.

One of the most interesting exchanges occurred with Senator Homer Ferguson on the question of the Bureau's acting as a regulatory agency. Ferguson grilled Astin deeply on many points, particularly on the question of the Bureau having done testing for the NBBB, but then he came to a question about the Bureau acting tacitly as a regulatory agency:

SENATOR FERGUSON: I am concerned with the possibility that the National Bureau of Standards may become—may be used as a regulatory body of proprietary products. Do you think that is possible with what has happened in this case?

DR. ASTIN: Well, first, we do not have any regulatory authority or responsibility, but we do—

SENATOR FERGUSON: Well, you can regulate pretty well through the Post Office fraud order, can you not?

DR. ASTIN: That is not our initiative, sir. All we try to do is to assist them on a technical problem.

SENATOR FERGUSON: I say you can, though—you can have cooperation between the Post Office and your Department or the Federal Trade, and you can do pretty well on regulation, can you not?

DR. ASTIN: I don't know how we could take any responsibility for the regulation when that belongs to them. We try to give them technical information to help them, but they are doing the regulating, not us.

SENATOR FERGUSON: Then, you would say that you do not think it ought to be denominated a regulatory body?

DR. ASTIN: We don't want to be a regulatory body; we are a fact finding organization.

Later Senator Ferguson returned to the topic:

SENATOR FERGUSON: Do you think the National Bureau of Standards by following its policy of disseminating technical data, when not specifically directed toward scientific or technological progress, at the professional and production level, is broadening gratuitously and, perhaps inadvertently, into a regulatory activity?

DR. ASTIN: Indirectly it might be so construed, but—

SENATOR FERGUSON: Would it not be, as a matter of fact, a regulatory activity? Isn't that what this has amounted to?

DR. ASTIN: Well, one can extend that and say that, similarly, all progress in science and technology is regulatory. The invention of the incandescent lamp bulb made obsolete gas lights and so on, so that if you carry this too far, then you would never disseminate any scientific information because it might have some effect on curtailing the marketing of some products that it is related to.

Astin's analogy was not an exact one, but the question was not pursued. It was clear, however, that no one wanted the Bureau to act like a regulatory agency—with or without authority.

In spite of all the reservations on the committee, it is quite clear that the members were ready to think well of the Bureau as well as Astin, whom they admired at least as a solid professional in the Civil Service, and who had stood up well under his current difficulties. Thus, near the end of his testimony the following exchange occurred:

SENATOR SMATHERS: Now, just one last question, prompted by my good friend, the Senator from Kansas, about the relative worth of the product aspirin as compared to the relative worth of AD-X2, in your offhand opinion do you think that the value of aspirin had been proved and established more so than the value of AD-X2?

DR. ASTIN: I buy aspirin.

SENATOR SMATHERS: No further questions.

SENATOR SPARKMAN: In considerable quantity?

SENATOR HUNT: Lately?

THE CHAIRMAN: Doctor, I hope we weren't the cause of you buying any.

DR. ASTIN: I have got a great big 85-grain tablet that I keep in my desk. It is National Bureau of Standards size.¹³⁶

Weber, the third of the principal witnesses, testified on the morning of July 25, 1953. His testimony was relatively short, perhaps caused by the fact that he was unwilling to make any evaluation of AD-X2. His prepared statement was:

It is the position of the MIT group that no conclusions can definitely be drawn as to the commercial utility of AD-X2 or lack of it, based on the MIT experiments, and that the drawing of definite conclusions based on limited laboratory experiments as to the commercial utility of AD-X2 is not justified.¹³⁷

Under questioning from Senator Sparkman, he also agreed with the statement of Beattie about the lack of correlation of the MIT results with the "normal use of such a battery."

Finally, concerning Laidler's analysis of the MIT results in the SSBC press release, the exchange went as follows:

SENATOR SPARKMAN: Dr. Laidler's statement was made an appendix to [the press release].

DR. WEBER: Yes, I have read that part.

SENATOR SPARKMAN: All right. Was that, in your opinion, or was it not a fair interpretation?

DR. WEBER: It was not my opinion. He expressed an opinion of his own.¹³⁸

¹³⁶ A. V. Astin testimony, AD-X2 Hearings: 330-331. Eighty-five grains is 5000 milligrams. The normal aspirin tablet is 325 milligrams. The tablet (there are actually two) and a Lucite-encased box of AD-X2 were traditionally handed down from director to director. They are now in the NIST Museum collection.

¹³⁷ H. C. Weber testimony, AD-X2 Hearings: 372.

¹³⁸ *Ibid.*, 393.

Weber's testimony effectively ended consideration of the MIT tests, at least in the political arena. The staff of the SSCSB had suffered a great loss of face.

Of the remaining twelve witnesses, only one—James C. Beene of the Kelly Air Force Base in San Antonio—testified against AD-X2, saying he would not buy any for his own use. The others—with various degrees of enthusiasm—testified to its effectiveness, prompting the committee to request that the Department of Defense and the Navy “resume testing it for use in submarine batteries.”¹³⁹

The hearings concluded abruptly at midday on June 26. Other witnesses, including Laidler, were to have been called, but they were not.

THE INCIDENT WINDS DOWN

It was clear with the end of the hearings that the denouement of the AD-X2 incident had passed. On the political front, nothing happened. Aside from the already mentioned recommendation about the investigation of AD-X2 for use in submarine batteries, and a letter to the Post Office Department recommending the removal of the suspended fraud order against Ritchie, the committee did nothing, although it did issue an annual report of its activities, part of which covered the AD-X2 hearings. Despite pertinent questions it had raised during the hearings about the Bureau's possible tacit and inadvertent behavior as a regulatory agency; about the Bureau's relations to industry and the National Better Business Bureau; about the possibility that a businessman who gave the impression of being honest and dedicated had all but been forced out of business by the Government; and other questions and issues, the committee did not initiate nor recommend any legislative action. Perhaps this came about because it was a select committee that had no legislative authority. And, possibly because of the hurried adjournment, it did not even have a closing statement. Perhaps the issues raised and discussed were too ill-defined, too vague to permit a resolution.¹⁴⁰ Whatever the reason, the AD-X2 incident was over on the political front, and the only further contact between Ritchie and the Bureau was to come across the table at FTC hearings.

But if the climax had passed, there were still events that had to transpire before the incident, let alone its aftermath, can be said to have ended. In particular, the two regulatory agencies—the POD and the FTC—still had unfinished business to transact, and the Bureau had two committees investigating it. And it had a director who was in some kind of limbo from which he had to be released. For both the Bureau and Ritchie, important events were still to take place.

¹³⁹ Lawrence, *Battery Additive Controversy*: 26.

¹⁴⁰ Library of Congress, Legislative Reference Service, “AD-X2: The Difficulty in Proving a Negative,” chapter 3 in *Technical Information for Congress: Report to the Subcommittee on Science, Research, and Development of the Committee on Science and Astronautics, U. S. House of Representatives, 91st Cong., 1st sess., 25 April, 1969.*

THE POST OFFICE DEPARTMENT AND THE FEDERAL TRADE COMMISSION

At the close of the hearings, the POD fraud order on Pioneers was still in effect, albeit suspended. But the postmaster general was quick to act. On August 20, 1953, somewhat less than two months after the hearings, he cancelled the fraud order.¹⁴¹ The release reads:

Since the original hearings conflicting scientific testimony of competent authorities and the statements of satisfied users have been presented to the Senate Committee on Small Business.

A scientific evaluation is now being conducted under the auspices of the Department of Commerce.

In view of these circumstances the fraud order is cancelled.

In more detail, the release explains that the postmaster general had considered the original letters by Thye and Weeks, the transcript of the hearings before the SSBC, and a letter on July 15 from Weeks. On the basis of this evidence, the POD reached the conclusions that:

- (A) There is a substantial disagreement as to the relative benefits of AD-X2.
- (B) That the Department of Commerce has authorized further study and investigation of the merits of battery additives.
- (C) That based upon all of the evidence, that is to say, the evidence introduced in the original proceeding, together with the evidence introduced subsequent thereto in support of respondents' motion, there is insufficient proof of an actual intent by Ritchie to deceive which is required to warrant and maintain a fraud order.

Matters before the FTC were not so quickly resolved.¹⁴² It had not acted since its original investigation in 1951 and, despite some pressure from the press, did not act until 1954, when, on March 11, it charged that Pioneers used "false, misleading and deceptive claims, statements, and representations." Hearings began in Washington on July 26 and ended for the Bureau with rebuttal testimony on September 22. Then, in order to obtain user testimony, hearings were held in thirteen different cities throughout the country. The hearings dragged on through 103 sessions until November 9, 1955, when the hearing examiner ruled in favor of Ritchie. The examiner found that the user testimony counterbalanced the scientific evidence, and the commission's lawyers had not met the burden of proof.¹⁴³

The decision was appealed by the commission attorneys as well as Ritchie, who felt that the examiner's decision was in part favorable to the Bureau. Finally, on May 16,

¹⁴¹ Post Office Department, Release No. 977, August 20, 1953.

¹⁴² Lawrence, *Battery Additive Controversy*: 29-31, gives a detailed discussion of the hearings before the FTC. The first part of the account presented here is a shortened version of that discussion.

¹⁴³ *United States of America Before Federal Trade Commission, In the Matter of Pioneers, Inc., and Jess M. Ritchie, Initial Decision*, by William L. Pack, Hearing Examiner, November 9, 1955, Docket No. 6190.

1956—more than eight years after Randall's initial letter to Vinal—the full commission dismissed the complaint against Ritchie.¹⁴⁴ It was a great victory for him.

But Ritchie tried to go further. He began advertising that his product had been approved by the FTC and had been Government tested and approved, whereupon the FTC brought another complaint against Ritchie. This time he lost. On September 7, 1960, he was ordered to cease and desist.¹⁴⁵

And Ritchie had other dealings with the Government. On July 20, 1956, Congressman John J. Allen, Jr., of California introduced a bill to pay Pioneers an unspecified sum of money "in full settlement of all claims . . . for compensation for losses . . ." ¹⁴⁶ This bill was not passed, but a following Congressional Resolution permitted Ritchie to sue the Government.¹⁴⁷ He did so—for \$2.4 million. When he saw the defendant's (i.e., the Department of Justice's) case at a pretrial conference, Ritchie asked for dismissal. In December, 1961, the case was dismissed with prejudice; Ritchie could not reopen it. Astin commented, "I am advised that this is the first time that a suit referred to the U.S. Court of Claims by the Congress has been dismissed with prejudice."¹⁴⁸ This action may be termed the last event in the AD-X2 incident.¹⁴⁹

THE BUREAU

Of the various institutions involved in the AD-X2 incident, the Bureau was the most affected. The first event to occur after the hearings was a pleasant one. On August 22, 1953—just two days after the POD order—the AD-X2 affair, which had become a running story in the press ever since Astin's dismissal, erupted once again into headlines. "Astin Keeps Job—Weeks," shouted a *Washington Times-Herald* headline. It and newspapers throughout the Nation were reporting a six-page news release from the Department of Commerce on the previous day announcing that Weeks had decided to reinstate Astin.¹⁵⁰ The release said that Weeks was taking Astin back as "a member of my team" for the "best interests of the Bureau and the public."

¹⁴⁴ Federal Trade Commission, *In the Matter of Pioneers, Inc., and Jess M. Ritchie, Opinion of the Commission*, by Anderson, Commissioner, May 16, 1956, Docket No. 6190.

¹⁴⁵ Federal Trade Commission, *In the Matter of Pioneers, Inc., and Jess M. Ritchie, Decision of the Commission and Order to File Report of Compliance, Initial Decision*, by Walter R. Johnson, Hearing Examiner, September 7, 1960, Docket No. 7844.

¹⁴⁶ Congress, House, *A Bill for the Relief of Pioneers, Incorporated, a corporation, and Jess M. Ritchie, individually, and as an officer of said corporation*, 84th Cong., 2d sess., HR 12333.

¹⁴⁷ Congress, House, *Resolution Providing for Sending the Bill H.R. 3875 and Accompany Papers to the United States Court of Claims*, 85th Cong., 2d sess., H. Res. 167.

¹⁴⁸ U.S. Department of Commerce, "Statement by A. V. Astin, Director, National Bureau of Standards," December 15, 1961, National Bureau of Standards TRG-6277.

¹⁴⁹ "AD-X2: The Case of the Mysterious Battery Additive Comes to an End," *Science* 134 (1961): 2086.

¹⁵⁰ U.S. Department of Commerce, "Statement of Secretary of Commerce Sinclair Weeks," Saturday, August 22, 1953. G-394-A.

What seemed like a sudden decision had not been made so hastily. Weeks had asked the Bureau's Visiting Committee to suggest a list of candidates for the position of director, and the committee unanimously urged the retention of Astin.¹⁵¹ The press release went on to quote Weeks that the AD-X2 incident "obscured the real problem." His major concerns were:

1. Serious lack of balance in the programs of the Bureau.
2. Imperfections in the system of evaluating commercial products.
3. Inadequacies of organization and administrative control.

Rather than a vindication, Astin said he would prefer to term Weeks' action as "a sincere change of mind on the part of the Secretary of Commerce."¹⁵² In fact, Astin's scrupulously correct behavior toward his superiors, his willingness to follow orders, his understanding of the reason behind his dismissal, and most of all his lack of rancor, were probably instrumental in changing Weeks' mind. The release went on to quote heavily from the as-yet unreleased report of the evaluation committee under Dr. Mervin Kelly which agreed with his analysis and detailed it.

Of significance for the Bureau was the announcement in the press release that it was to be removed from the jurisdiction of Sheaffer and placed under Assistant Secretary for Administration James C. Worthy, who had strongly opposed Astin's dismissal. On September 15, Sheaffer resigned. And, in a result that could hardly have been anticipated after his actions upon taking office, Weeks went on to become a strong supporter of Astin and the Bureau.

The lives of the Bureau scientists working directly in the AD-X2 affair were not made materially easier by the winding down of the incident. While there was no longer a direct confrontation with Ritchie on the scientific front, there was a remaining battle on the legal front. Many of them had to testify at the FTC hearings and were vigorously—even brutally in the memory of some of the participants—cross-examined by Ritchie's lawyers.¹⁵³ The lives of some of them were irrevocably changed by the experience. All the battery scientists were also kept busy supplying information, both oral and in writing, to the two committees studying the Bureau and the AD-X2 incident. And they kept going the comparison experiments that were the basis of the "public test." The experiments were finally shut down in the fall of 1953. They gave no reason for the Bureau to change its mind.

THE COMMITTEES REPORT

Even as the hearings were taking place, the two committees—one to evaluate the functions and operations of the Bureau and the other to evaluate its work on AD-X2—formed at Weeks' request by the Bureau's Visiting Committee and the National Academy of Sciences, were doing their work.

¹⁵¹ Ibid, 5.

¹⁵² "Weeks Puts Astin Back As Director of Bureau," *Washington Post*, August 22, 1953: 1.

¹⁵³ The Bureau participants in the FTC hearings were Allen V. Astin, Bruce B. Bendigo, Robert L. Cottington, D. Norman Craig, Paul C. Donnelly, Churchill Eisenhart, Walter J. Hamer, Cyrus G. Malmberg, Bourdon F. Scribner, and Clarence L. Snyder.

The first of these, commonly called the Kelly Committee after its chairman, was the first to report.¹⁵⁴ Indeed, it reported orally to Weeks continually as it was doing its work, and Weeks acted on those verbal recommendations before receiving a final report. In fact, his press release reinstating Astin was largely based on the committee's recommendation.

It can be fairly said that no other single report has had as great an effect on the history of the Bureau as the "Kelly Committee Report," as it is commonly known. It can be said that its influence came about as much from its philosophy of the Bureau's nature and role as from the specific recommendations it made. With respect to philosophy, the words were welcome to the Bureau:

It is the Committee's considered judgment that our highly industrialized society requires a Bureau of Standards that is the finest that can be created. To the extent that the Bureau is weak or inadequate, our technologic society is handicapping itself. By the very nature of its functions the Bureau's work must not be "reasonably good," it must be superior. It is not sufficient to have fairly good standards of measurement; fairly good methods of testing materials, mechanisms or structures; or reasonably good determination of important physical constants. The standards, the measurements, the test procedures must be the very best, the most accurate, the most reliable that can possibly be achieved at any given time, limited only by the state of the art at the time. It is thus more than a play on words to say that the "standards" by which the Bureau is judged must be the very highest and best.¹⁵⁵

With respect to recommendations, the committee found "the volume of weaponry work has become large in comparison with all other activities of the Bureau. Its relative size and its effect on the other Bureau programs make its transfer from the Bureau desirable." Hence it recommended the "transfer of weaponry projects to the Department of Defense," but recommended "continued use of the Bureau by Department of Defense and Atomic Energy Commission for non-weaponry science and technical aid." Following these recommendations, on September 27, 1953, four ordnance divisions, totaling 2000 persons—1600 in three divisions at the Harry Diamond Ordnance Laboratory in Washington, and 400 at the Missile Development

¹⁵⁴ *A Report to The Secretary of Commerce by the Ad Hoc Committee for the Evaluation of the Present Functions of the National Bureau of Standards: A Report on the Present Functions and Operations of the National Bureau of Standards With Their Evaluation in Relation to Present National Needs and Recommendations for the Improvement and Strengthening of the Bureau*, October 15, 1953. The members of the committee were: Mervin J. Kelly, Chairman, President, Bell Telephone Laboratories; Lee A. DuBridge, President, California Institute of Technology; William L. Everitt, Dean of Engineering, University of Illinois; James W. Parker, President, Detroit Edison; Kenneth S. Pitzer, Dean, College of Chemistry, University of California; J. Barkley Rosser, Professor, Cornell University; Guy Suits, Vice President and Director of Research, General Electric; Clyde Williams, President, Battelle Memorial Institute; and Abel Wolman, Professor, Sanitary Engineering, The Johns Hopkins University.

¹⁵⁵ *Ibid.*, 4.

Division in Corona, California—were transferred to Army Ordnance and Naval Ordnance respectively, although all operations remained at their respective sites. The transferred operations were the total of the Bureau programs in proximity fuzes and guided missiles. Eventually, in 1973, the ordnance work carried out at the Van Ness site was moved to newly constructed ordnance facilities in Adelphi, MD.¹⁵⁶

Another recommendation that was quickly adopted was that of having advisory committees, each appointed by a specific scientific or engineering society, review each operating unit of the Bureau yearly and report their findings to the director. This recommendation was quickly implemented, and the life of a middle-manager at the Bureau would never again be the same.

A fourth recommendation was meant to insulate the Bureau from political pressures and have it work only in the scientific arena, where its competence lay. The committee recommended "Division of primary responsibility for policy and procedures on commercial product tests between the Secretary of Commerce and the director of the Bureau." The Bureau would eventually give up its commercial product testing. But perhaps the most important recommendation it made was based on the finding:

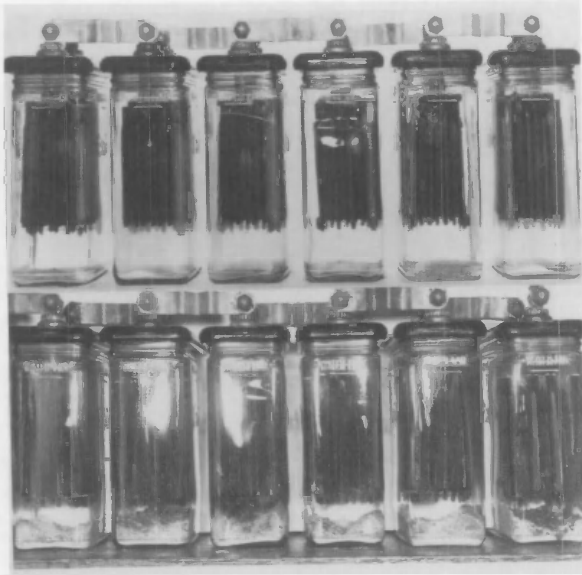
Since the close of the war the technology of the Nation has shot rapidly forward. The Bureau's basic programs expanded until 1950 but at a rate beneath that justified by the needs. Since 1950 the decrease in basic programs must be considered as tragic. The ground lost since 1950 should be regained in the next two fiscal years and the programs then expanded as detailed studies by the Director and his advisory committees find necessary.

This led to the starkly simple recommendation of "higher level of activity in the basic programs." These recommendations, and five others the committee made, were to provide a course of action for at least the near-term future of the Bureau, and an agenda for Director Astin.

The second committee, with Zay Jeffries as its chairman, was formed to evaluate the Bureau's work on battery additives. The Jeffries Committee Report, while not as causative of change at the Bureau as was that of the Kelly Committee, was perhaps even more welcome to the Bureau battery scientists and all others who had been involved in the technical aspects of the AD-X2 affair.¹⁵⁷ They were kept busy providing

¹⁵⁶ MFP, 497. The Harry Diamond Ordnance Laboratory was comprised of the Ordnance Electronics, Electromechanical, and Ordnance Development Divisions. Named in 1949 for the guiding force in the Bureau's ordnance research, it was renamed the Diamond Ordnance Fuze Laboratories upon its transfer in 1953 to the Army. Missile development became the Naval Ordnance Laboratories (Corona) upon its transfer to the Navy.

¹⁵⁷ National Academy of Sciences, *Report of the Committee on Battery Additives of the National Academy of Sciences*, October 30, 1953. The members of the committee were: Zay Jeffries, Chairman, Vice President (Retired), General Electric Company; Elmer K. Bolton, Director of Chemical Department (Retired), E. I. du Pont de Nemours and Co.; William G. Cochran, Professor of Biostatistics, The Johns Hopkins University; J. P. Fugassi, Professor of Physical Chemistry, Carnegie Institute of Technology; John G. Kirkwood, Professor of Chemistry, Yale University; Victor K. LaMer, Professor of Chemistry, Columbia University; Lewis G. Longworth, Member, Rockefeller Institute for Medical Research; Joseph E. Mayer, Professor of Physical Chemistry, University of Chicago; Fred E. Terman, Dean, School of Engineering, Stanford University; and Samuel S. Wilkes, Professor of Mathematical Statistics, Princeton University.



In July 1953, at the request of the Jeffries Committee, six lead-acid batteries used as part of the d-c power supply at NBS were randomly selected for inclusion in a test of a battery additive (top). Three of the cells were treated with additive, three were not, and all six were placed back in routine service. After 10.5 years the treated cells (second, third, and sixth, left to right bottom) showed more deposit and their averaged electrical capacity was but 3.5 percent of the untreated cells.¹⁵⁸

the committee with written reports and oral briefing, but the result was gratifying. After examining “the statements made by the Bureau relating to AD-X2,” judging “the quality of the Bureau’s work in the field of lead acid storage battery testing,” and studying “the claims made for Battery AD-X2 and the scientific evidence developed to date in support of those claims,” the committee came to its conclusions. It found:

1. that the quality of the work of the National Bureau of Standards in the field of lead acid storage battery testing is excellent, and
2. that while Pioneers, Inc., claims that AD-X2 has substantial merit, the relevant data now available to the Committee on the effects of AD-X2 are adequate to support the position of the Bureau of Standards that the material is without merit.

The committee made a single recommendation to the Bureau: “The Committee recommends that no additional tests on the merit of AD-X2 be undertaken by it [the Bureau] or under its supervision.” The Bureau’s work had been vindicated by the Nation’s highest scientific authority. While the staff could not forget AD-X2, they could at least go on to work on something else.

CONCLUSIONS

Comparison of the Aquella and AD-X2 incidents shows similarities and differences with respect to adherence to Bureau policy and the resulting effects. In the Aquella case, there were possible oversights that caused a Bureau report naming a proprietary product to become public, something that policy was designed to prevent. This led to embarrassment for the Bureau, and a temporary period in which the proponents of Aquella were able to use the Bureau’s results in advertising purposes. In the AD-X2 incident, the Bureau did everything in accordance with its policy, yet the result was far

¹⁵⁸ “Battery Additive—Findings of an In-House Field Experiment,” *Technical News Bulletin* 54 (April 1970): 81.

greater—if not permanent—trauma for the Bureau. There was evidently an Achilles' heel in publishing the results of commodity testing, and this weakness was exploited brilliantly by an aggressive, persistent, and politically astute entrepreneur. As a result, a period of extensive change for the Bureau was initiated. That this change might very well have happened even without the AD-X2 incident is immaterial; the incident was the catalyst of change.

The weakness surfaced with the testing of a class of materials that met two rather stringent conditions. First, a large number of proprietary products had to fit in the class, and the Bureau needed to have tested many. Irrespective of the test results, the Bureau, following its policy as enunciated by Astin that "withholding . . . such data would be considered prejudicial to the interests of the general public,"¹⁵⁹ had reason to issue a publication notifying the general public of its findings on the class of materials, not on specific products. Second, the materials—sodium and magnesium sulfates in the case of AD-X2—had to prove to be neither beneficial nor detrimental, but "ineffective." In publishing this statement, however, it put itself in the awkward, if not impossible, scientific position of having to prove a negative. A manufacturer could claim that his product differed from the general class, as Ritchie did, and refuting those claims was difficult. Finally, there had to be something about the product or the mode of selling that led to satisfaction among many users, so that testimonials could be provided. Under these conditions, the Bureau's position was untenable, and Ritchie exploited it.

Inevitably one seeks to find winners and losers in incidents of this type. In the Aquella incident, there were no clear-cut winners, and both sides were clear-cut losers. The proponents of Aquella, victorious for a while, were eventually found at fault by the FTC, while the Bureau suffered serious embarrassment. Deciding on winnings and losses in the AD-X2 incident is much more difficult. Both sides suffered considerable trauma during the height of the incident. Some persons—O'Connor, Sheaffer, and Laidler—had damage done to their careers. Ritchie claimed that the whole incident cost him more than \$2 million, and the time and effort spent by the Bureau has never been calculated, but was many man-ears.

But in another sense, both sides were winners. At the end of the incident, Ritchie still had his business, and was in a stronger position than at the beginning. His advertising had been cleared by the FTC and the POD, and he could rightfully claim that he had taken on the whole Government and won. In fact, he liked the whole political game so well that he ran for Congress, but he lost.

The Bureau was also stronger at the end of the affair, and in this sense was a clear-cut winner. In the person of Astin, it was looked upon by the scientific community as a heroic champion in the preservation of scientific freedom and integrity against attempts at Governmental control. Astin himself was in a formidable position, stronger than any director before or after him. And the Bureau had been investigated by two high-level committees, one which found its work impeccable while the other gave it a welcome agenda for the future. Perhaps the results made the trauma of the whole episode worthwhile.

¹⁵⁹ A. V. Astin testimony, AD-X2 Hearings: 214.

Larger segments of the Nation are more difficult to analyze. In politics nothing happened; no legislation was passed. But another segment of society was clearly affected. The whole Nation had learned that the scientific community was a force to contend with, and in this sense science was a winner. But in the legal arena, it is not clear that science won. Indeed, it could be argued that in this arena science was a loser. At both the FTC and the POD, its results were weighed against testimonials that had no scientific basis, and the two were found to be of equal weight.



The first instruction on the back of each AD-X2 package, to clean the top of the battery and posts, is good battery maintenance procedure. Perhaps it was the reason for the satisfied users of AD-X2.

A question that was never answered by the Bureau, or anyone else, was how AD-X2 could have had so many satisfied users. Perhaps what should have been considered was not only the effect of the chemicals found in an envelope. Pioneers, after all, sold a total package, and this consisted of a chemical powder and a set of instructions. No one ever said that the instructions were poor. In fact, they were good, and it is entirely possible that under pressure of the money paid for the package, a consumer would follow the instructions carefully, achieving good results, and never realize that the same results could have been obtained by following the directions and forgetting about the white powder. Perhaps this strange, non-ending, convoluted affair was decided correctly in the legal arena after all.