

STANDARDIZING THE BUREAU

The Battery Additive Controversy and
the Reorganization of the National Bureau of Standards

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On July 24, 1953, the United States Department of Commerce released the following statement:

Secretary of Defense Charles E. Wilson and Secretary of Commerce Sinclair Weeks jointly announced today a plan to transfer from the National Bureau of Standards to the Department of Defense the major ordnance research and development activities, including staff and facilities, now located at NBS. This transfer is in accordance with recommendations made by Dr. Mervin J. Kelly, Chairman of the special committee established by the Secretary of Commerce to evaluate the present functions of the National Bureau of Standards in relation to the present national needs.(1)

The statement went on to justify and particularize the basic decision. The press release pointed out that the ordnance program at the Bureau had grown so as to "change the

1. Press release, Dept. of Commerce, July 24, 1953.
NBS Archives, Box 202.

character of the organization," and that over 50 percent of the Bureau's fifty million dollar operating budget during the previous fiscal year was devoted to these activities. The statement summarized the mechanics of the transfer and emphasized the satisfaction of the Department of Defense with the work done by the Bureau of Standards. Every effort would be made to maintain the quality of staff in the ordnance divisions being transferred, and the esprit de corps which they enjoyed while part of NBS. Both Wilson and Weeks supported the continued use of NBS by Defense for suitable work in areas other than weapons development. In addition, "Secretary Weeks believes that the transfer will be the means of strengthening the Bureau's basic program, an accomplishment which has been one of his primary objectives in administering the Bureau."

The ramifications of this carefully worded press release would be great indeed for the federal institution most representative of basic research in the physical sciences. And yet, the announcement caused little debate in and out of government. This is not to be attributed to public ignorance or apathy. Indeed, the Country and its government were more acutely aware of the National Bureau of Standards in the fall of 1953 than at any time before or after. But there was good reason for this decision to be eclipsed by other events in the minds of scientists, politicians and the public at large. It was in these events

that the decision to sever the ordnance divisions found its genesis, and an understanding of these events is a window on the Nation's peculiar ambivalence for its scientists and scientific institutions in the early Cold War period.

The NBS Style Before Reorganization

Secretary Wilson was not simply being diplomatic when he expressed his satisfaction with the defense work of NBS. Edward U. Condon (Director of NBS between 1945 and 1951) summarized this relationship at the end of his tenure at the Bureau.

"Work in this field [defense] has always been an important part of the program of the laboratories of the National Bureau of Standards. The Bureau has a long history in meeting such military needs, having first developed the optical glass industry in World War I, having initiated the atomic bomb project in World War II, and also having played a large part in the development of proximity fuzes, having developed the only fully automatic guided missile to be used in warfare thus far, and having done much to improve knowledge of long-distance radio transmission on which the continuity of military communications depends." (2)

The military and the Bureau were quite amicable.

Defense had long found its needs served at the Bureau with efficiency and imagination, and the particular strength of the Bureau in the research and

2. Edward U. Condon, "Some Reflections on Science in the Federal Government," Physics Today, April, 1952. This is a transcript of a talk given by Condon at the National Academy of Sciences on Sept. 25, 1951.

development of advanced electronics fit hand-in-glove with the military's post-war agenda. David Noble sees the work of the Bureau during World War II as transcending the particular hardware, and contributing to a broad base of creative talent in electronics. Speaking with special reference to the Bureau of Standards, Noble feels "...the war had generated a wide range of components and devices, greater understanding of electronic technology, and an army of electronics enthusiasts." (3)

Electronics at the Bureau was almost entirely defense-related, and was largely defined by the four divisions to be removed: Ordnance Development, Electronic Ordnance, Electromechanical Ordnance, and Missile Development. If we are to find an explanation for the seeming ready acceptance by the Secretary of Defense of this radical restructuring of the Bureau of Standards, it is not that of technical inadequacy. In April, 1953, the Research and Development Board reported to Wilson that the proximity fuse program (a prominent NBS project) was a "most important function" for defense, and there was "no other group in existence with the necessary team experience and diversity of skills which are required to manage proximity fuse developments for guided missiles, rockets, mortars and bombs." (3a) Neither is it sensible to assume the

3. David F. Noble Forces of Production (New York, 1986), p.47.

3a. New Republic, May 25, 1953, p.11

Defense Department imagined no problems would attend the transfer, and that work would continue as usual with simply a different authorization appearing on the paychecks. The following episode is instructive in this regard.

"One day (Harold) Goldberg, (Myron) Domsitz, and I (Jacob Rabinow) were called in to meet with Astin (Allen V. Astin succeeded E.U. Condon as Director of NBS in 1951) and General Simon. (4) General Simon was head of Army R&D. We were told that we would be split from the Bureau and become a Class 2 civilian installation in the Army. That was the highest type installation they could have. And I said, 'But, General Simon, I heard you tell the story once that if you want original work you cannot do it in an Army installation, that you have to do it outside. Is that correct?'

"He said, 'Yes, but unfortunately I have to do it for political reasons.'

[At this point, Rabinow explains that, prior to
this meeting, he had tried to lobby

4. Effective April 1, 1952, NBS restructured the Ordnance Development Division, responsible for research, development and engineering of electronic ordnance devices. Domsitz, Rabinow and Goldberg became chiefs of Ordnance Development Programs A, B and C, respectively (also designated Divisions 13, 16 and 17). In the same reorganization, the Corona Ordnance Branch (see p. below) was designated Branch D. Bureau Order 52-22, March 20, 1952. NBS Archives, Administrative History File, Box 1.

against the removal of the ordnance divisions at high levels of the Army and the Air Force.]

"When we were told this [that the divisions would join the Army], my immediate comment to Astin and Simon was to say, 'Well, I have had a wonderful time. I loved the work and the people, and now I am going to quit...'" (5)

It is quite reasonable that the staffs of the ordnance divisions would be chary of the working conditions to which they had grown accustomed, and would fear the loss of such under military supervision. Personal interviews with alumni of the laboratories reveal a high degree of collegiality and informality which was also expressed in a very liberal administrative style. (6) Research during the war and afterward was characterized by a fluidity of work associations. An engineer or technician might be formally assigned to one branch, but perform a test or draw a template for a project in a different branch or division as needed, with no concern of strict accounting for time and materials. Division chiefs greatly enjoyed this

5. Jacob Rabinow, unpublished transcript of personal recollections (taped 1982), p.15. NBS Archives.

6. Robert D. Huntoon, interview at his home, Nov.5, 1986; Jacob Rabinow, interview at NBS, Nov.3, 1986; Lauriston Taylor, interview at his home, Dec.11, 1986.

free-wheeling approach, as a project was much less prone to be bottle-necked by a single step waiting for administrative due-process, or the sluggish work-docket of an isolated and disinterested third party.

Robert Huntoon, who later headed Division 15, the Missile Development Lab at Corona, Calif., recalled the plasticity of administration during the war. There was no formal project structure, and therefore work was not billed to a specific project. "The Director was essentially given a pot of money," which was then distributed to the various working groups. "The organization was changed about every two weeks."

An organizational chart from 1943 reveals very little line authority. (7) "Division D-General" was the heading for the NBS defense-related work. Its stated purpose was "secret and confidential defense projects for Division 4, National Defense Research Committee," and cooperation with other NDRC divisions. The NBS technical staff of Division D was divided into Groups 1 through 5. Scattered about were NDRC assistants and administrators, with NDRC's Division 5 tacked on as an addition to the Bureau's technical groups.

Hugh L. Dryden was an NBS staff member, though his organizational duties were as National Defense Research

7. "NBS Functional and Personnel Organization Charts," Jan.1, 1943, NBS Archives, Box 349.

Committee member, head of NDRC's Division 5 and NBS consultant! Jacob Rabinow recalls this conversation.

"I once stopped Dr. Dryden on the street and asked him, 'Just how is this organized? Who works for whom?'

"And he said, 'Jake, I don't know.'

"I said, 'Well, if you don't know, then I won't bother.' And I never did. We didn't get organized until after the war. We then had the usual organizations of sections, divisions, and so on."

(8)

The vast majority of the Bureau's operating funds came from the Department of Defense under the rubrik of "transferred funds." This placed the Bureau in the status of sub-contractor, and effectively removed it from the Congressional budget process. This was not illegal in any sense, and provision for such work was explicit in the legislation affecting NBS.

Congress first addressed the problem of transferring funds to the Bureau from outside agencies during the Harding administration. The Appropriation Act of (May 20) 1920 provided for any Government agency requiring scientific investigations within the scope of NBS functions to transfer

8. Rabinow transcript, op.cit., p.7.

appropriate sums (with the approval of the Secretary of Commerce) to the Bureau. Public Law 212 (1932) extended the policy of transferred funds and services to all branches of the Government, assuming such services cannot "be as conveniently or more cheaply performed by private agencies..." One more piece of legislation of interest here is Public Law 619 (1950), which at long last amended the Bureau's Organic Act of 1901. This Act allowed for functions NBS had been vigorously pursuing over the years, but which were difficult to reconcile with its original purpose. Section 2 of P.L.619 outlines six broad areas of work suitable for the Bureau of Standards. The first four included the maintenance of physical standards and scientific constants, development of codes and standard practices, and the testing of materials for Government and independent use. The fifth provision permits NBS to advise Government agencies on scientific problems, and the sixth allows for the "[i]nvention and development of devices to serve special needs of the Government." (8a)

In fiscal year 1953, the direct appropriations to NBS were approximately 8 million dollars, and the transfer funds amounted to more than 40 million dollars. Of those 40 million, nearly 39 million came from the Department of Defense and the Atomic Energy Commission. (9) By the time

8a. Cochrane, op.cit., Appendix C.

9. "A Report to the Secretary of Commerce by the Ad Hoc Committee for Evaluation of the Present Functions and Operations of the National Bureau of Standards," submitted Oct.15, 1953, Sec. IV, Table 2. NBS Archives Box 199.

Eisenhower took office the Bureau was putting most of its effort into the last of the recently outlined functions, which was supported almost entirely by the 'ancillary' transferrance of funds. In terms of budget and research commitment the Bureau of Standards was out of balance.

Still, it is all too easy to consider the 'corrective reorganization' of the Bureau as inevitable. It is true that

the emphasis on defense was exacting a cost on basic research at NBS, but the trend had been to expand the military work rather than attempt any limitation, and that aggressive growth appears to have been attractive to the Department of Defense and the Bureau of Standards both. It may be mentioned as well that there is no evidence to connect this reorganization with the political turmoil surrounding the previous Bureau director, Edward Condon, who came under the scrutiny of the House Un-American Activities Committee, except the siege mentality which infected some of the participants.

AD-X2: An Opportune Catalyst

There were those, in 1953, who would find the Bureau of Standards an attractive target for ideological warfare, both in Congress and the in the new administration. But for most of its history, the Bureau has not been very prominent in the public consciousness, or in the minds of elected officials. Condon recalled the following incident from a hearing before the House Appropriations Committee.

"I remember one time one Congressman had me quite upset because he was scowling through the whole of my presentation. When it came his turn to ask questions he asked me, 'Doctor where is the National Bureau of Standards?' I told him it was out on Connecticut Avenue and he said excitedly, 'Is that what that place is?' and he became quite friendly."

(10)

It is not at all surprising that a public, largely ignorant in scientific matters, would find it especially difficult to comprehend and remember the various activities of NBS. (11) A special article in the Sunday edition of the

10. Condon, op.cit., p.11.

11. A study in 1971 submitted that the nature and diversity of the Bureau's work are obscure to the average citizen. "While much of what the Bureau does or does not do can directly affect the lives of the average citizen, the diversity and technical nature of its work tends to discourage interest in the NBS by him...The Bureau in a real sense has become more than just a Bureau of Standards. The alternative designation as the Institutes for Science and Technology which the

Washington Post attempted to educate the public and rid it of its misconceptions. (12) The article included a photo layout showing acoustical, optical, and radiation experiments as well as materials testing and structural analysis. The history of the Bureau was sketched with technical highlights such as the development of the alternating current radio set, "a feat that put radio into the homes." But before the Eisenhower administration had even taken office, attention was turned toward the Bureau of Standards by a very unlikely man, Jess M. Ritchie, and his invention, AD-X2.

Jess Ritchie listed himself in the 1953 Oakland , California phone directory as a psychologist and specialist in alcoholism, as well as an expert in prolonging the life of electrical batteries. (13) At other times he portrayed

Secretary of Commerce suggested in 1964 probably more accurately reflects the real nature of its work." (National Bureau of Standards Review of its Organization and Operations, p.115. A study prepared by the Science Policy Research Division, Congressional Research Service, Library of Congress, G.P.O., 1971). Allen Astin (then Director Emeritus) addressed the topic of a name-change for the Bureau in a prepared statement before the House Subcommittee on Science, Research, and Development. "I have viewed such suggestions with mixed thoughts. I can definitely see several advantages to a broader name. On the other hand, the present name is held in high regard by the Bureau's specialized clients and there is danger of losing some of this with a new name." (National Bureau of Standards Oversight Hearings, Sept. 16, 21, 22, 23 and 28, 1971, U.S.G.P.O., 1971.)

12. Nate Haseltine, "Atom is Mightier than Additive at Bureau of Standards," The Washington Post, June 28, 1953.

13. Newsweek, July 6, 1953, p.11.

himself in more ingenuous tones. One newspaper interview reported he "said proudly he had only a sixth-grade education. He's been a bulldozer operator, a construction worker, a contractor." (14)

It was Ritchie's interest in storage batteries (e.g. automobile batteries), and his vision of the fortune to be made from them which brought him to the attention of certain large business interests. But it was his skilfull and zealous response to what he felt was the unjust persecution of a citizen by his government which propelled him to the national spotlight. What follows next is an account of the main elements of the controversy.(15)

14. The Washington Daily News, April 21, 1953. Ritchie's claim to the title of "psychologist" stems from a certificate of Doctor of Psychology he received from a correspondence school called the College of Universal Truth (cited in The Washington Post, Nov. 29, 1953).

15. The story of AD-X2, Ritchie's battery additive powder, is chronicled in several sources.

i. An interesting, prosaic account from Ritchie's point of view is a magazine interview entitled "My Battle for Battery AD-X2." This was entered into the record of the Hearings before the Select Committee on Small Business, United States Senate, Investigations of Battery Additive AD-X2, United States G.P.O., 1953, pp.482-491. The entire body of these hearings, comprising 785 pages, is the single most complete collection of relevant documents. NBS Archives, box 199.

ii. A very brief account is included in the "Report of the Committee on Battery Additives of the National Academy of Sciences," (to the Secretary of Commerce, submitted Oct.30, 1953). NBS Archives, box 682.

iii. Technical Information for Congress, Report to the Subcommittee on Science, Research, and Development, U.S. House of Representatives, Ninety-First Congress. U.S. G.P.O., 1969. This work summarizes a number of issue-centered case studies, the first being AD-X2: an intelligent analysis of policy.

Jess Ritchie first entertained the idea of an elixir for improving the performance of standard lead-acid storage batteries while working construction in the Phillipines in 1946. As "one of the men in charge of an \$80 million construction project for the United States Army Engineers" he was constantly plagued by battery failure in trucks and heavy equipment. Having recalled seeing someone squeeze a lemon into a failed storage battery that subsequently took a charge, Ritchie tried a similar approach. There were no lemons available, but plenty of fresh limes, and in short order he was keeping "a small army of men busy squeezing lime juice into the dead batteries and with a rapid change program got enough use out of them to keep [his] machines going on schedule. [He] not only saved countless thousands of dollars in lost time, but kept Uncle Sam from getting slapped with a fat bill for new batteries." (16)

Ritchie returned from the Phillipines with no particular plans to pursue battery additives, but the idea that something might be found to effectively prolong battery life was still on his mind. There was good reason why such an agent would find a ready and lucrative market. The shortage of lead was particularly acute in the United States

16. Senate Select Committee Hearings on AD-X2, op.cit., p. 483, (referred to hereafter as Hearings).

in 1947-49. Return of WWII scrap was small, and domestic requirements very great, including batteries for resumed domestic auto production, lead-sheathed cable, bearing bronze (10% lead), atomic shielding, and leaded gasoline. During the years of suspended automobile manufacture (1943-45), car owners had sought ways to prolong the life of these 'irreplaceable' vehicles, and battery life was commonly considered to be on the order of 2 years. As Ritchie himself told the Senate committee: "Batteries were as scarce as hen's teeth; you couldn't get them in 1947." Although Ritchie insisted that the majority of his business was with the users of large, industrial storage batteries, and other professional concerns, the shortage of lead would have an economic impact throughout the battery industry.

(17)

The events immediately following Ritchie's return from the Phillipines constitute the most obscure part of the story. In one account Mr. Ritchie was inspired by a nagging suspicion that something could be done to reduce battery failure and the challenge of critics that nothing, in fact, could be done. He set up shop in an old furniture store, tearing apart old batteries, rebuilding them, and experimenting with various chemical additions to the

17. Technical Information for Congress, 1969, op.cit., pp. 15, 16. Ritchie is quoted from Hearings, p.19.

acid-solution electrolyte in an effort to restore their charging capacity. An encyclopedia article acquainted him with the name of Merle Randall, a professor emeritus of physical chemistry at the University of California and resident of Berkeley. A letter to Professor Randall was answered two weeks later by telephone, and the two were soon collaborating. Between April and October of 1947 experimentation on over 1600 different formulas culminated in the particular additive known as AD-X2. (18)

18. This is the basic account from the magazine interview found in the Hearings(pp.483-4). In an interview with The Washington Daily News (April 21, 1953), the story is pared down to: "When he got back to Oakland in 1947, he experimented on batteries with Dr.Merle Randall, professor emeritus at the University of California. In late 1947 they came on AD-X2 'purely by accident,' Mr. Ritchie said." This last statement is actually not in contradiction to Ritchie's testimony that "after we got this thing, Dr.Randall assured me that we had done it backward, that all of our reasoning and all of our work, from what he could determine on the product, had been a waste of time, for the simple reason that what we had done was illogical and could only have happened as an accident." Hearings, p.18.

The more disturbing difficulties concern Ritchie's association with another battery additive named Protecto-Charge. In a letter from Randall to Dr.George W. Vinal (head of electrochemistry) of NBS dated April 23, 1948, Randall speaks of Ritchie purchasing equity in a patent application by one Donald E. Keifer for Protecto-Charge. (Hearings, pp. 21 and 44-45) Upon examination by Senator Hubert Humphrey, Ritchie owned up to running into a fellow in New York (possibly Keifer) and buying a half-interest in a business, though it turned out to be "a tremendous amount of trouble." (p.20)

The letter was the first by Randall to the Bureau extolling the virtues of Ritchie's battery additive. It describes the physical effect on the battery plates, suggests the processes at play, and finally lists commercial operations which had been having great success with the treatment. "Reductions of 85, 90, and in one instance 95

By any standard, Ritchie soon found great success by very aggressive and savvy marketing. He personally visited concerns where storage battery maintenance constituted a major outlay. He gave AD-X2 to a battery foreman at the Army's Benicia Arsenal to try in any batteries he wished. The foreman was skeptical about any 'battery dopes,' and chose batteries which were considered hopeless. Nonetheless, the batteries became usable, and thereafter the Arsenal became a steady customer until regulations prevented further procurement of AD-X2. (19) Ritchie estimated his sales for

percent in annual battery expense during the past year has (sic) been reported by large firms, some of which have always had an intelligent battery-service program." Even reading back just one year from the date of the letter puts these 'user field-tests' at the very beginning of the collaboration of Ritchie and Randall, nowhere close to the time Ritchie asserted for the final formulation of AD-X2, let alone the time needed to get the product in the field.

It is not problematic that Randall is discussing Protecto-Charge rather than AD-X2, for Ritchie readily admitted that the name change came later (1948). But if there is any merit to the user success being claimed by Randall, it is purchased at the expense of all the collaborative laboratory work. Randall (coauthor with G.N.Lewis of Thermodynamics and the Free Energy of Chemical Substances, 1923) died in March of 1950.

Allen Astin mentioned a similar discrepancy in his testimony. (Hearings, p.219) Referring to another letter from Randall, Astin noted : "...in one of Randall's letters of July 1948 was a statement that in one experiment with these additives, treated batteries had remained in service without a single failure for as long as 17 months. This is interesting in the light of more recent statements that the additive was not invented until the fall of 1947."

19.Hearings, p. 485 and pp. 359-365. The testimony of the foreman, Emerson Blum, is characteristic of users. The following is part of an extended (and highly repetitive) examination by the Chairman (Sen. Edward Thye) concerning the discard of new batteries on new government vehicles due

the first half of 1951 to be between \$130,000 and \$140,000.(20) Ritchie's subsequent marketing difficulties came from several sources, one of which was his initial success.

The National Bureau of Standards had performed numerous tests on storage battery additives dating back to 1919, and had published their effect, or lack of effect, as early as

to a battery condition allegedly treatable with AD-X2 (sulfation: see Appendix A).

The Chairman: And when a battery is highly sulfated you can't give it a charge?

Mr. Blum: When they get too bad you cannot.

The Chairman: You cannot, and you have had to jerk those batteries out of that brandnew equipment and put in a new battery?

Mr. Blum: Yes, sir; that's right.

The Chairman: And they go to the junkyard?

Mr. Blum: That's right.

The Chairman: Do you think that the brandnew battery with an application of this compound would become serviceable?

Mr. Blum: Yes, sir.

The Chairman: You know you are under oath, sir.

Mr. Blum: I don't care; I still believe it.

The Chairman: You still have that strong knowledge and conviction?

Mr. Blum: I have.

The Chairman: Because of your years of experience?

Mr. Blum: That's right.

The Chairman: That if you could make an application of this powder, that battery would come back into service?

Mr. Blum: Yes, sir.

The Chairman: And you have asked for the powder?

Mr. Blum: I have.

The Chairman: And they say it is not on your standard equipment and they deny it to you?

Mr. Blum: No; they didn't say it wasn't on standard equipment. I have a boss. I work under a boss like anybody else, and I put my requisition in to him. He said they cancelled it up on the hill; that's all I know.

20. Hearings, p. 189.

1925. They tested additives for the Federal Trade Commission, Post Office, and Navy, and in 1931 issued Letter Circular 302, "Battery Compounds and Solutions." (21)

These circulars, available upon request for a nominal fee, were issued from time to time on a variety of subjects as a public service. They might cover information from reports of the American Society for Testing Materials and the American Standards Association, or they might cover such diverse topics as "Metric and English distance equivalents for athletic events," "Porcelain and pottery," and "The legibility of ledgers." (22) It was the Bureau's policy, however, not to endorse or condemn any product by name.

Ritchie's account states that business was going nicely in 1948 until the Bureau's Letter Circular 302 began to be widely circulated among battery users. (23) Repeated correspondence from Professor Rnadall to the Bureau (to both Edward Condon and George Vinal, Chief of Electrochemistry Division) seemed to get no response. Condon at last replied to these enquiries of the previous 9 months in September, 1949.

21. Hearings, p.218. By March 1952, NBS had tested a host of battery additives on 48 different occasions, dating back to 1919. Table of tests, NBS Archives, box 205.

22. Rexmond C. Cochrane, Measures for Progress: A History of the National Bureau of Standards (U.S.G.P.O., 1974), p. 251 (note).

23. Hearings, p.485.

Randall, consultant to Pioneers, Inc. (Ritchie's company whose additive was their only product), had been trying to get the Bureau to make an exception for AD-X2 by not classifying it with the welter of battery dopes deemed of no value to storage batteries. (24) Randall had supplied testimony and some technical arguments to establish AD-X2's merits. Condon's reply was a refutation of the evidence adduced, stating that nothing indicated AD-X2 was in any way different from a general class of additive which had shown no merit in laboratory tests. He also tried to convince Randall of the relatively passive role played by the Bureau. "Other agencies of the Federal government are not obliged to 'ultimately require an approval by the U.S. National Bureau of Standards.' The Bureau issues no formal 'approvals' in the sense that the word is used, for instance, by the Underwriters Laboratories. We merely report the results of each of our experimental tests to the government agency which requested it and that agency is free to make such use of it as it desires. This is one of the reasons why we consistently decline to make tests of commercial products for private concerns, except for calibration tests which serve to disseminate the units of measurement."

This all sounds innocent enough, and very circumspect.

24. Condon's reply of Sept. 12, 1949, Hearings, pp.80,81. Randall's letters, ibid, pp.46,92 (Dec.1, 1948 to Vinal, Aug.17, 1949 to Condon).

Was there anything to the case Randall and Ritchie were making, that in a direct or indirect sense the Bureau was involved in an aggressive campaign to close off the market for AD-X2? After all, while the Bureau did make technical information available to those who were interested, it was not in the business of vigorously promulgating such information among those who had not requested it.

The active agent responsible for the wide distribution of information on battery additives turned out to be the National Better Business Bureau. A considerable correspondence among the NBBB (mainly in the person of K.B. Willson, Operating Manager), the Bureau of Standards (Condon, Astin, George Vinal and Paul Howard; the last two of the Electrochemistry section), and the Oakland, California Better Business Bureau (Jack Harris, General Manager) between 1948 and 1952 reveals some very arcane maneuvering. (25) At one level, the National Better Business Bureau was simply doing its job, responding to requests for information about battery additives. And if it is a technical question, who better to provide the necessary scientific judgement than the National Bureau of Standards? The was difficulty in simply harkening back to Letter Circular 302. Ritchie and Randall were asserting a significant difference in effect existed between AD-X2 and

25. Hearings, pp.61,78,769-784.

the class of additives of similar composition which LC 302 considered worthless. (26) Vinal recognized the information was published quite a few years before, but as late as July, 1948 was not convinced that an updated version of the old circular was a pressing item for the Bureau to undertake, particularly at the expense of important defense work.

Nonetheless, Vinal did seem to understand the usefulness of a more current technical summary. By February, 1949 such a statement was still forthcoming, and Willson was becoming more anxious. "The persistent promotion of battery compounds to the public for use as additives to the battery electrolyte pose a serious problem, and we respectfully ask whether it will not be possible for the National Bureau of Standards to give us an up-to-date statement which we may use for the information and guidance of the public."

26. The primary constituents of AD-X2 were sodium and magnesium sulfates (glauber and epsom salts, respectively). There was no evidence of a compound or alum structure (as suggested by Randall) and the trace element content, which Ritchie held so secret and considered so crucial, was "for the most part...the same trace elements usually found in varying amounts in commercial grades of sodium sulfate or magnesium sulfate or in the normal battery electrolyte. It is also pertinent to note in connection with the claim of the uniqueness of the composition of AD-X2 that [NBS] analyses have shown variations between samples as high as 19 percent in the ratio of sodium sulfate in AD-X2 to the magnesium sulfate. The ratio of the quantities of trace elements also vary appreciably." (Hearings, pp.218-20, testimony of Allen Astin) See Appendix A for a brief technical discussion on the operation of lead-acid batteries, and the purported action of AD-X2.

The reader may well wonder just what "public" this is, which besieges NBBB with technical questions and is not satisfied with the considerable information already available. The answer is found in a letter from Keystone Batteries, Inc. to The Association of American Battery Manufacturers, Inc., dated February 2, 1950. Sections of the letter are as follows:

"When the AD-X2 first came out, we thought they would kill themselves off in short order like most of the other battery additives in the past, but they seem to be getting stronger and reaching out further all the time, and they will probably reach midwest and east unless something is being done...

"We heard that they sold the Army Ordnance Department in California \$25,000 worth of AD-X2, but the Ordnance Department in Washington has since issued a bulletin to all departments stating this AD-X2 to be of no benefit to batteries and instructing them to stop using same. Is there any way we can verify this?

"We think it will be of benefit to all members if the association came out with a bulletin quoting Bureau of Standards pamphlet, part of Geo.W.Vinal's letter dated December 7, 1949, and this Army bulletin (if available).

"We are informed that the 'Tire, Battery and Accessory News' (published by the Trade Press Bureau, Kansas City, Mo.) are (sic) endorsing this preparation probably on the strength of receiving an ad from the AD-X2 people, and we think it might be a good idea if the association brought some pressure to bear on this magazine and made them retract this endorsement. If they refuse to do this, I feel sure that they would lose most of their subscriptions and ads from battery manufacturers, etc.

"This is a serious situation. We know that we have lost a considerable amount of business for last month alone and the loss of business to large manufacturers must have run into thousands.

"We feel sure that with the cooperation of the association and all its members we will be able to lick this thing..."(27)

27. There is evidence that the battery manufacturers were indeed a constituency, and that the fears voiced by Keystone Batteries were not those of a rogue outfit. A letter dated Oct. 19, 1951 from the advertising manager of Commercial Car Journal to the advertising firm representing Pioneers, Inc. explained, with great embarrassment, why a half-page spot for AD-X2 had to be denied. "...I was summoned to the office of the President of Chilton Company, who had at his desk a representative of the advertising agency handling the Exide Battery account.

"This gentleman was protesting the acceptance of Pioneers, Inc. advertising in Commercial Care Journal on the