Post Office Department, should lead to prompt modifications in the practice of the National Bureau of Standards of condemning products marketed by small businessmen solely on the basis of mere laboratory data without proper weight being given to how the products perform in actual use." On May 16, 1956, the FTC ruled 4 - 0 to drop its case, finding that "overwhelming" user testimony outweighed the divided but predominantly adverse scientific test results.(97)

When word reached Astin in 1961 that the Government had dismissed Ritchie's damage suit, and that the case could not be reopened, his response was one of understandable relief. In a short memo to the Bureau staff he noted that it was finally over, and now they could get on with their work.(98) Astin could not have guessed that battery additives would bubble to the surface again six years later. The Director would again be called to present evidence to a Senate committee, on an additive known as "Higgins 10 Year Battery Life" in 1967. This time judgement was rendered that the

---

97. The New York Times, May 17, 1956. Sparkman's comments appear in Senate Small Business Committee press release, Nov.18, 1955, NBS Archives, box 202.

98. Recalled by Walter Weinstein in Astin interview, 1983, op.cit., p.16. Astin also made a short statement to the press, saying that the action added "further to the record of the National Bureau of Standards for excellent scientific and technical work applied to the public interest." Dept. of Commerce press release, Dec.15, 1961. NBS Archives, box 682.

product was without merit simply by chemical analysis.

> "Based upon that chemical analysis, the expected performance of the product as a material to promote the effectiveness or useful life of lead-acid storage batteries was estimated. Our conclusion was that the product would perform no differently than [sic] many other battery additives examined by the Bureau in previous years, all of which were without merit."(99)

Astin reported this conclusion while allowing that the composition of the present additive was "similar but not identical to" other additives tested. Apparently, such testimony was now sufficient evidence to prompt the Senate committee and a separate House committee scurrying to uncover the guilty party which which authorized the Government purchase and shipment of such a product.(100)

And the Bureau is still called upon to act as scientific arbiter in cases which seem remote to standards, but which fall under the broader mission of providing technical advisement to Government when requested to do so.

---

99. "Statement of A.V.Astin, Director of the National Bureau of Standards Before the Permanent Investigations Subcommittee of the Senate Committee on Government Operations on Higgins 10 Year Battery Life and White Magic Motor Conditioner," April 25, 1967. NBS Archives, Astin Files, box 2.

100. The New York Times, April 26, 1967.

Recently, the Bureau was asked to judge the merits of a device which its inventor claims able to generate 'free' electrical energy. A patent application was denied under a clause long in effect at the Patent Office which allows it to categorically reject claims for perpetual motion devices. The inventor successfully petitioned to have a model of his device tested, and that responsibility devolved to the Bureau of Standards. The initial publicity which attended the petition, as well as the small army of technical professionals who attested that the device actually produced more energy than it consumed seemed a disturbing echo from the past.(101)

On the larger issue of science and politics, the remonstrations of many scientists in 1953 that politics should be kept out of science cannot be taken seriously, except as evidence of willful denial in professionals uncomfortable with the post-war landscape. After all, the scientific community was already highly politicized in

---

101. The case of Joseph Newman's generator discussed by Jacob Rabinow, in interview, op.cit.

dealings with itself.(102)

In this paper I have tried to resist the temptation of immediately 'setting the record straight' for the reader about the functional efficacy of AD-X2. Of course, such discussion is unavoidable, but I have tried to reveal the various evaluations of the additive in somewhat the same manner as they would have appeared to the legislators and other players in this drama, and leave the final analysis to the appropriate appendix. It is a most telling aspect of our citizenship in a republic of technology that even in considering an historical episode there is a powerful urge to know the scientific verdict from the outset, and then read backward. Though we might promise ourselves to remain unbiased as we go back and consider the events in their context, we want some assurance that we will not be taken in as well and be shown the fool.

---

102. This point really needs little elaboration when one considers the intensely competitive positioning for facilities, staff, and government contracts since W.W.II. But the AD-X2 affair is also a case in point. Astin later recalled how inadequate and sloppy the MIT tests had been, and how the National Academy of Sciences representatives reacted. _"Well, the Jeffries Committee...completely vindicated our work and in a mild, polite way slapped MIT. I remember talking to someone...'we can't afford to offend MIT too much.' They made no bones about [it] that they didn't want to embarrass MIT anymore than they had to. That was the general attitude of the Jeffries Committee and that's why their reprimand of the Weber report was so mild. I think most of the members who looked at it didn't think any more of it than Walter Hamer (chemist who worked with Vinal) or I did." (Astin interview, op.cit., p.26)

An arrogance attends this scientific verdict which has led to many abuses of power and authority. One of the dangers well known to technocratic societies is the eager extension of a limited scientific conclusion to wider applications where the information available is not authoritative. Both scientists and laymen fall victim to this particular illogic. The frequent marshalling of social statistics to underwrite a particular policy initiative by one interest group and its exact opposite by another is one aspect of this dialectical violence to which we have grown most accustomed.

The AD-X2 controversy experienced this warfare of appropriated authority. The Bureau, in their most comprehensive test, expended a great amount of effort to design tests which would actually have meaning in determining whether AD-X2 extends battery life. It is not useful to simply ascertain a change in the physical properties of a battery which in some cases coincide with an increased electrical capacity or efficiency, such as raising the specific gravity of the electrolyte, or a cooler battery temperature during charging. Almost anything added to a battery will result in a physical change. Neither is it significant that a treated battery take a charge under extreme conditions not related to normal usage. The treatment must produce a measurable increase in storage capacity under normal conditions which fall above the range

of variability of given test cells. The problems of significance, variability, normal usage and randomness were difficult, but essential, aspects of the final verdict being demanded of the Bureau scientists, and a great burden fell on the division of Statistical Engineering to model significant tests.

For those parties who wished AD-X2 to be vindicated, they found their validation in those laboratory observations which saw some effects which could be associated with increased electrical capacity, though there was little concern for control cells, randomness, and normal operating parameters. This, coupled with many thousands of satisfied (or at least not complaining) customers was proof enough. In reality, there was ample reason why customers were not complaining. In the first place, the investment was small. (Astin pointed out in the hearings that a typical three dollar treatment packet contained about five cents worth of raw materials at wholesale prices. This was a tremendous profit for Ritchie, but still the price of the additive compared to the price of a new battery was very small.) Secondly, the instructions with the additive told the user to clean the battery terminals, and other tips of battery maintenance which would improve the performance of any battery. Finally, the typical user would have great difficulty determining significant change if the battery were already functional, or knowing whether or not his

battery was mechanically unsound (e.g. broken or shorted plates inside the battery) which the additive was not supposed to remedy. The question of customer satisfaction was very differnt from the question the Bureau had thought it was to answer.

The misuse of scientific authority also comes in another variety, essentially the converse of the above situation. This consists of first determining the desirable conclusion, and then altering scientific evidence to fit that conclusion, by selectively publicizing some results and ignoring or covering up others. The scientific community was most concerned that the Bureau was being forced to perjure itself in this manner. It is cause for reflection to consider why it was so upsetting to Commerce and certain legislators that the Bureau would not 'come into line' on this issue. Perhaps the protesting scientists heard the tones of power brokers in bygone days, of clerics who could not gain the acquiescence of dissenters, or monarchs unable to gain the sanction of their clerics.

Throughout this essay there has been a heavy reliance on the popular press. This is necessary as for many items newspaper articles constitue the primary - or only - source. It is also important because to a very great extent the principal players expressed themselves (and tried to gain advantage) through the press, rather than speaking to each other.

It is in this context that Astin's call for scientists to exercise their social responsibility has reached a curious, if not disturbing, fruition. The scientific issues about which the voting public must be informed in the years since the second world war have loomed ever larger. Whether it is matters in health science, industrial policy, environmental problems, or the arms race, the public must needs be provided the very benevolent service Astin sought. But as the stakes grew higher, each vested interest has taken the initiative of supplying the public with its own "official" view, explaining why its stock-in-trade was essential to the public weal. The public relations divisions of major contractors manufacture , what must now be considered, a very large fraction of the company's product. In defense-related matters in particular, the public is held hostage by opinions which the lay person finds impossible to reconcile. To be sure, the scientists have extended a helping-hand to assist the poor benighted citizen understand the "real issue," while the other hand has a firm grip on his wallet.

Perhaps the only real lesson learned was that captured in a talk by Mervin Kelly to the American Physical Society in 1957. He could have addressed himself to all scientists when he said, "the ivory towered existence is no more and, like it or not, the physicist is in the midst of the fast moving currents of the day..."(103) But, of course, the audience already knew that.

---

103. Cited by Paul Forman in "Behind Quantum Mechanics: U.S. National Security and Postwar Physical Research," unpublished typescript, pp.7,8.

Appendix A

Storage Battery Processes

The lead acid battery is a simple device, and its state of development by 1953 was not greatly different from its original design in the mid-nineteenth century. At that time, lead plates were first processed by placing them in various solutions (electrolytes) and successively charging and discharging the arrangement from an outside electrical source. This processing would leave sponge lead on the surface of the plates which would serve as the negative electrodes, and lead peroxide on the surface of the plates which would constitute positive electrodes.

The processed plates would then be immersed in an electrolyte of dilute sulfuric acid and connected to external electrical terminals to make a functional storage cell. When connected to an electrical load (a circuit through which current can flow), both the sponge lead and the lead peroxide are converted to lead sulfate as the electrochemical energy of the battery is used in the circuit. If an outside charging current is applied to the battery, the chemical process is reversed. The surface of the negative plate is restored to sponge lead, and the surface of the positive plate once again becomes lead peroxide. This is the normal action of such a storage cell. It is analogous to compressing and relaxing a mechanical spring. To "charge" the spring, work must be done on the spring from an outside agent. Once compressed, the spring

can store this energy and release it at some future time. The electrochemical energy of the battery is stored until allowed to flow through a lamp or motor and perform work. In theory, the charge/discharge cycling of a storage battery has no limits, but in practice a lead acid battery can lose its ability to accept and deliver electrical energy.

Improvements came to batter design in the late nineteenth century. Electrodes made of lead grids, into which was pressed an active paste, proved superior to solid lead plates. Studies showed it useful to add certain materials such as barium sulfate and lignin derivatives to the negative grid paste. The mechanical aspect of the battery was also important. For a battery to work well in a demanding environment (such as an automobile) the pasted grids must withstand shock and vibration, and the plate separators, case, and terminals must withstand deterioration. Even the normal release of gas during electrical cycling can loosen material from a grid and cause a sediment (mud) to accumulate at the bottom of a battery. The loss of grid paste material decreases battery capacity, and can render a cell inoperative if it forms an electrical bridge (short) between positive an negative plates.

As already pointed out, in the normal operation of a lead acid battery, lead sulfate forms on both plates during discharge. In regular usage, this lead sulfate has a very fine crystal structure. If a battery stands idle for a long period, however, the lead sulfate can form a large crystal

structure which is difficult to convert back to active material, though successive low-current cycling (charge/discharge) may restore the plates. It is this condition (large lead sulfate crystal structure) which was commonly referred to (by Ritchie and others) as sulfation.

Many additive combinations had been introduced over the years to try to restore capacity to storage batteries. Some were essentially inert (colored water) and others were extremely harmful (copper and iron salts). Sodium and magnesium sulfates, the primary constituents of AD-X2, were quite common additives. Prof. Merle Randall, Ritchie's collaborator in developing AD-X2, tried to argue that this additive behaved differently than others with similar ingredients once in solution in the battery electrolyte. Among the effects he reported were an enhanced dissolving of plate sulfation, reduced shedding of plate material, and less evolution of gas during charging. (Hearings pp.72-75, 92-99). The Bureau found AD-X2 to slightly lower charging efficiency in batteries nearly discharged, and slightly less energy delivered at high rates of discharge. On the whole, the additive had little effect and was not very harmful.

In 1947 the Willard Storage Battery Co. analyzed nearly a thousand batteries to determine the common causes for battery failure. Corrosion in positive plates accounted for 40 percent of the failures. Cracked partitions between cells caused 28 percent of the failures. Among the other failures (buckled plates, shorted separators, shedding, leaking cases, and others) sulfation was not mentioned by name.

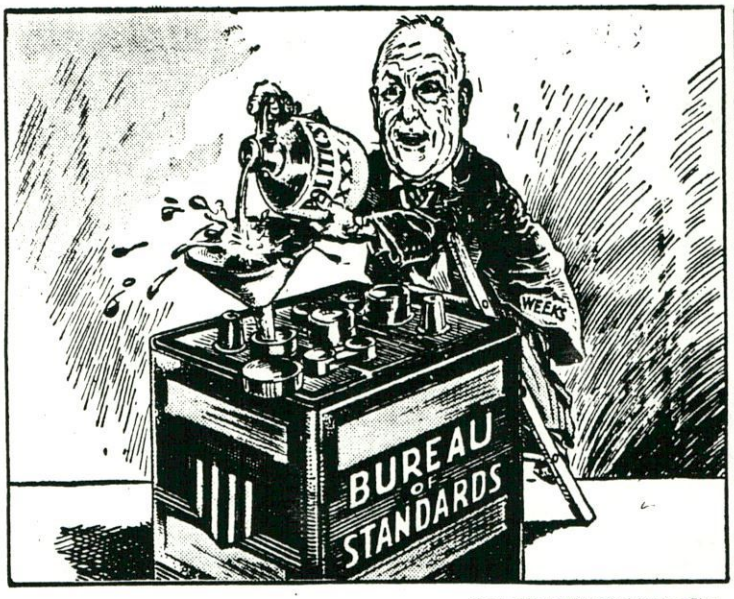
(Source: "Report of the Committee on Battery Additives of the National Academy of Sciences," Oct.30, 1953, pp.6,7)

Appendix B

"Go Away, Boy — You Bother Me"

Washington Post April 7, 1953

TWO OBSERVATIONS ON THE BUREAU OF STANDARDS CASE



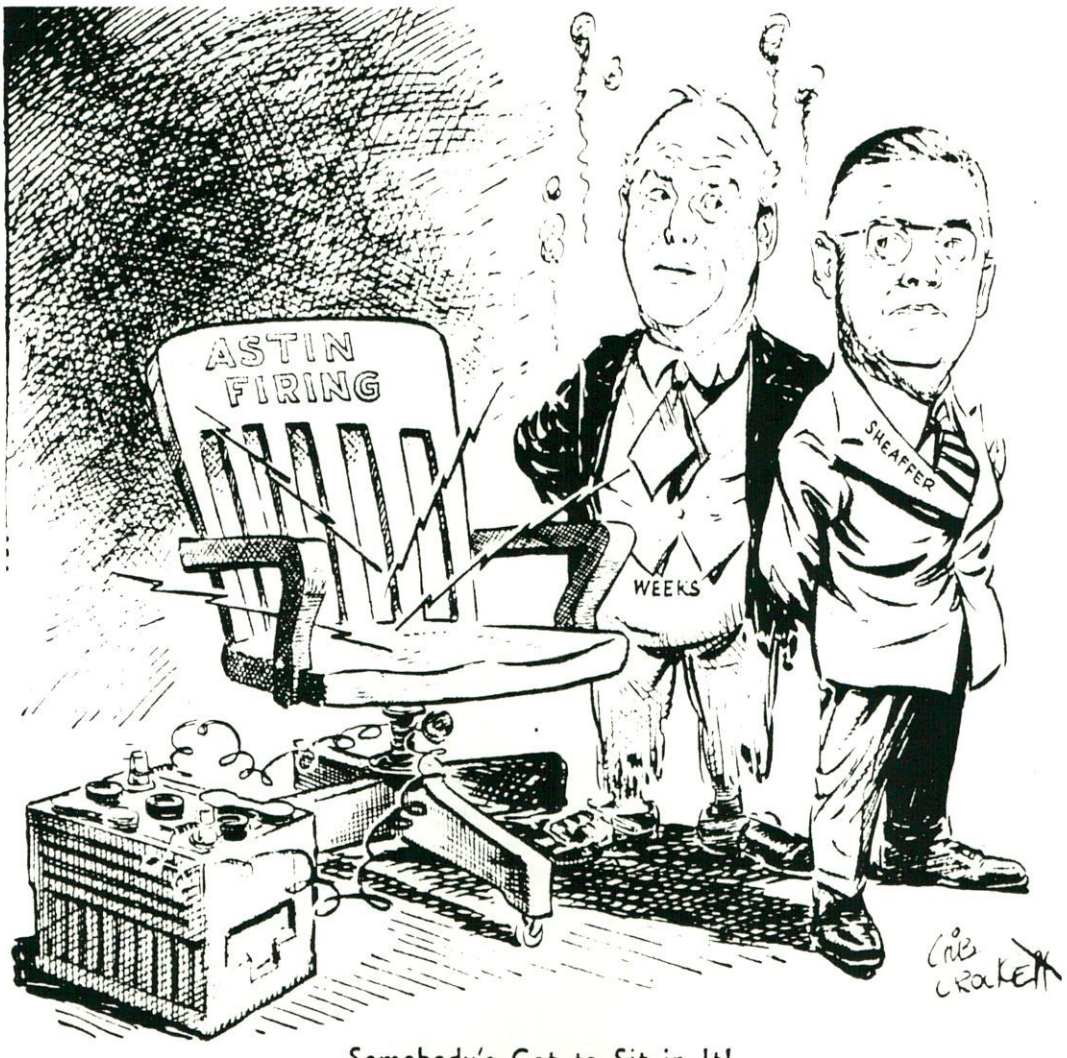
Berryman in The Washington Star

"New battery additive."

Herblock in The Washington Post

"Yes, I'm getting quite a charge out of it."

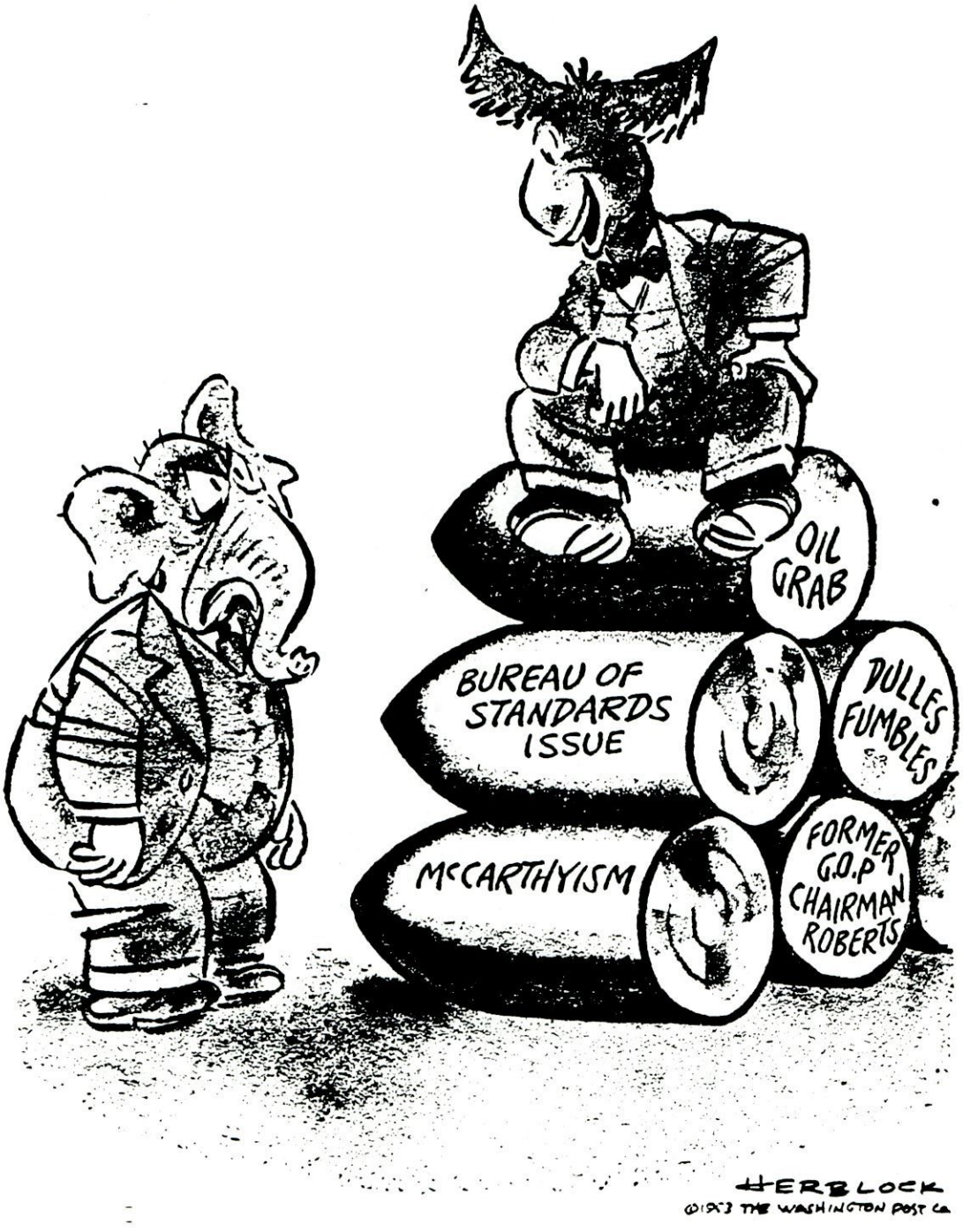
The New York Times, April 12, 1953



Somebody's Got to Sit in It!

The Evening Star, April 15, 1953

"What's This Talk About An Ammunition Shortage?"



The Washington Post April 14, 1953

"Try It Again, Men, And Be Sure You Get This Answer"

The Washington Post April 16, 1953

"THE BATTERY'S KINDA LOW BUT—"

St. Louis Post-Dispatch April 21, 1953

The Evening Star April 23, 1953

The Evening Star April 25, 1953

The Evening Star June 25, 1953

The Evening Star

"I Think The Battery Is Dead"

HERBLOCK
©1953 THE WASHINGTON POST CO.

The Washington Post November 15, 1953