Organizational Capabilities and U.S. War Production: The Controlled Materials Plan of World War II

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On November 2, 1942, Donald Nelson, former vice-president of Sears Roebuck, and chairman of the U.S. War Production Board (WPB), announced the introduction of the Controlled Materials Plan (CMP), a new system for controlling the distribution of critical materials to war production programs. CMP offered a sophisticated institutional framework for decision making on materials allocations, as well as a new mechanism for materials control. The plan would balance demand and supply for three critical materials: steel, aluminum, and copper; and it would ensure their availability in quantity, forms, and time required by approved programs and production schedules.

With CMP, Nelson and Washington's production chiefs offered organizational innovation as a way to lift total manufacturing output. A more effectively planned coordination of administrative units under WPB supervision would guide the distribution of materials to key metal-using plants, the manufacturing center of the nation's war economy.

CMP Origins

In its broadest context, CMP originated as a consequence of policy settlement between civilian and military production agencies on a balance between defense requirements and the nation's total overall production capacity. No amount of distribution control could assure balanced munitions production at industry and firm levels given unrealistic military demands. Military and civilian officials had clashed bitterly over this issue both before and after Pearl Harbor. The "feasibility dispute," as contemporaries described it, persisted until October 1942, when the military services finally yielded to civilian planners and agreed to bring their overall production goals within mutually agreeable limits [1, 14, pp. 96-97; 21, 23, pp. 220-224].

We can also understand CMP as one in a series of increasingly complex administrative devices that had developed haphazardly since 1940 as administrators responded to new industrial problems, including how to manage shortages in an economy in transition from peace to war [9, 18, 26]. The Production Requirements Plan (PRP), introduced on a voluntary basis at the end of December 1941, was the most comprehensive of the preceding

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experiments. Under PRP, manufacturers applied to WPB for blanket priorities on all critical materials they required for military or essential civilian production. PRP consolidated prior schemes for metals control. The plan also provided an important reporting system on inventories and consumption among metal-using plants.

Donald Nelson made PRP mandatory in the third quarter of 1942. Allocations came under it in the fourth quarter. Nelson felt obliged to respond to military assertions of jurisdictional authority. He had to confront growing business criticism of material shortages. He also felt compelled to show President Franklin D. Roosevelt that as WPB chief Nelson himself retained full control over the nation's production program. The sudden decision to make the scheme mandatory, however, triggered criticism both inside and outside of Washington. The program's subsequent difficulties in administration and information processing, coupled with growing press reports of materials shortages, appeared to justify the attack [5].

PRP could not ensure coordination among specific military end programs or among specific allotments of materials supplies. WPB controlled materials allocation; but the military services and other wartime production agencies controlled prime contracts and production programs. One analyst explained: "It was entirely possible for Ordnance to schedule the production of, say, 500 tanks per month in an arsenal; for the arsenal to apply on PRP for the material and be given 90% of steel and 80% of copper; for this 80% of copper to be reduced to 70% by the copper branch [of WPB], and for some subcontractor making a vital part to be given only 60% of his materials requirements" [12].

Debate over allocation methods for critical materials had preceded PRP's compulsory introduction, but it reached a crescendo during the late summer months of 1942. Representatives of the Navy Office of Procurement and Material and the Army Services of Supply promoted a warrant plan. Under this scheme major defense contractors would get warrants for critical materials and pass them down to subcontractors, who would use them as authorization to accompany orders to materials suppliers. General Motors and former Ford Motor Company executive Ernest Kanzler submitted proposals. So did the steel industry. Additional suggestions came from academic economists and government administrators, as well as from business executives in WPB's iron and steel, aluminum, and copper banches. They all supported more vertically integrated systems of materials control.

On September 20, 1942, in response to external and internal pressures, Nelson made Ferdinand Eberstadt WPB vice chairman for program determination, and chairman of the WPB's Requirements Committee. Such action cleared the way for a policy review. A Wall Street lawyer, investment banker, and close ally of military leaders as head of the Army/Navy Munitions Board, Eberstadt spearheaded the subsequent drive to think the materials problem through collectively. He also played a key role in giving the idea of vertical allocation organizational form. His conceptual power, incisiveness, and effective use of staff, especially his openness to bright young people, impressed all those who worked with him to draft a new plan over the next six weeks [4, 5, 22].

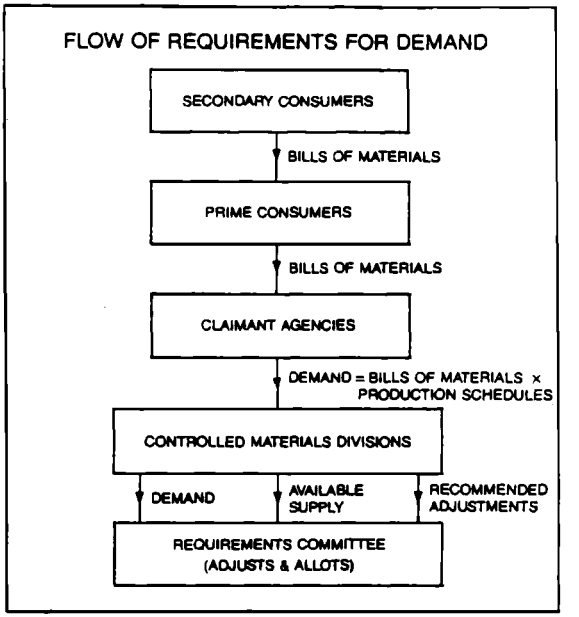
Eberstadt canvassed opinion among individual critics. He also established a central discussion forum, a Committee on a Materials Control Plan, in which industrial heavyweights could make their case. The series of eight meetings he conducted in late September and early October 1942, provided a high-powered seminar in wartime distribution and control problems. Debate centered on proposals from the steel and automotive industries. Eberstadt personally favored the Steel Budget Plan. It focused on resource constraints. Steel supplies would set production limits. Auto industry representatives, on the other hand, approached the issue in terms of a prime contractor's production schedule. Eberstadt treated Detroit proposals skeptically, however. He wondered how far he could trust production executives to conserve metal supply. Both plans, despite difference of emphasis, accepted vertical principles of metals distribution, however, and Eberstadt synthesized them into the final version of CMP, announced November 2, 1942 [8].

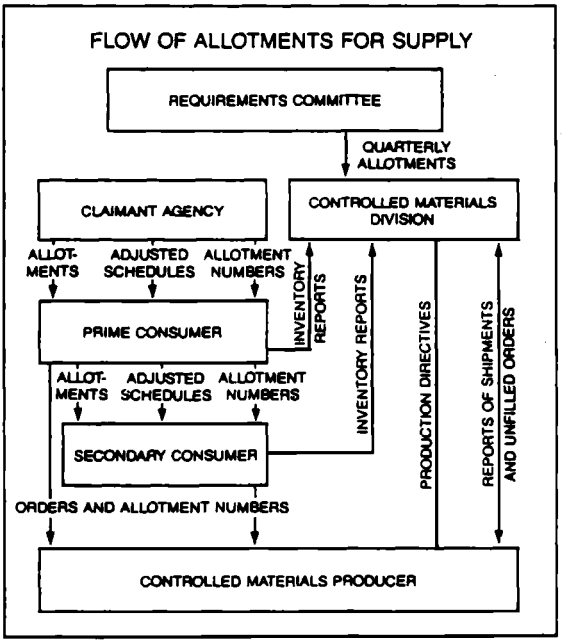
CMP Described

Eberstadt envisaged CMP organization as "a pyramid," he explained at the November press conference. [See charts.] "We work out from the control, decentralizing through the operation. You can only handle in one organization at the top the most general type of questions," he asserted, "and you must decentralize your operation just as fast and just as completely as you can, if you want to accomplish your job within the time available. That objective has been kept in mind in working up the plan."

The WPB's Requirements Committee stood at the apex of the CMP pyramid. That Committee, under Eberstadt's chairmanship, was composed of major government users of controlled materials, the so-called claimant agencies. They included the War and Navy Departments, the Maritime Commission, the Aircraft Scheduling Unit, the Office of Lend-Lease Administration, the Board of Economic Warfare, and WPB's Office of Civilian Supply. (Others were soon added.) The Committee passed on the ultimate balance--of exactly how much of a controlled material went to each claimant. These agencies were the WPB customers. They had responsibility for collecting bills of materials from prime contractors, who, in turn, obtained information from sub-contractors. "Your circle gets constantly wider," Eberstadt noted, "with the burden of your work being divided."

On the demand side of the application process, prime contractors submitted bills of materials to the Controlled Materials Branches of WPB (iron and steel, aluminum, copper) and to the Requirements Committee's staff. Each material branch also contained a miniature Requirements Committee of commodity specialists from different claimants. After analysis, statements of demand went to a Program Adjustment Committee, a working sub-committee of the Requirements Committee. PAC made final recommendations. Then the chairman, in consultation with the Requirements Committee, would consider last minute claimant appeals, before cutting the materials pie.


FLOW OF REQUIREMENTS FOR DEMAND
SECONDARY CONSUMERS
BILLS OF MATERIALS
PRIME CONSUMERS
BILLS OF MATERIALS
CLAIMANT AGENCIES
DEMAND = BILLS OF MATERIALS × PRODUCTION SCHEDULES
CONTROLLED MATERIALS DIVISIONS
DEMAND
AVAILABLE SUPPLY
RECOMMENDED ADJUSTMENTS
REQUIREMENTS COMMITTEE (ADJUSTS & ALLOTS)


FLOW OF ALLOTMENTS FOR SUPPLY
REQUIREMENTS COMMITTEE
QUARTERLY ALLOTMENTS
CLAIMANT AGENCY
CONTROLLED MATERIALS DIVISION
ALLOT-MENTS
ADJUSTED SCHEDULES
ALLOTMENT NUMBERS
INVENTORY REPORTS
INVENTORY REPORTS
PRODUCTION DIRECTIVES
REPORTS OF SHIPMENTS AND UNFILLED ORDERS
PRIME CONSUMER
ALLOT-MENTS
ADJUSTED SCHEDULES
ALLOTMENT NUMBERS
SECONDARY CONSUMER
ORDERS AND ALLOTMENT NUMBERS
CONTROLLED MATERIALS PRODUCER

The supply process then began. Once in receipt of allocations, claimants passed tickets to prime contractors, who passed them to producers' subs. Orders went to controlled materials--the steel, aluminum, and brass mills. A WPB allotment number was "the certified check to get basic controlled materials." A company with a check for controlled materials also received a preference rating for additional materials. Throughout the process, WPB's Controlled Materials Branches had the information necessary to ensure balanced production at each mill, as well as overall balance between material demand and material supply.

The plan, Eberstadt emphasized, would increase self-consciousness about program planning among claimant organizations. "It will force an Army program, a Navy program, a Maritime Commission program, a construction program, a Civilian Supply program. These requirements are submitted not simply for a quarter but they are submitted for the period of eighteen months." He also cited the plan's flexibility. Additional materials could be included as conditions required.

Suppliers and contractors would have time to adjust. Though announced in November 1942, CMP would become mandatory on July 1, 1943, after a transition period during the second quarter [24, 16].

A New Structure for a New Distribution Strategy

CMP's installation transformed the strategic positions of the iron and steel, aluminum and copper branches in WPB. They gained a more strategic role in central administration. Eberstadt had determined from the start to bring them "into full partnership in future operations." He also insisted that each branch--now division--have "a permanent industry committee tied right in with it, so that industry can be made a permanent full partner in the war enterprise" [10].

Eberstadt also established a Controlled Materials Plan Division to supervise CMP operations. He canvassed private firms for staff; he also appealed to the Business Advisory Council, a major voice of the corporate community in Washington policy debates. He recruited Harold Boechenstein, president and general manager of Owens-Corning Fiberglass Corporation, to direct the division. He appointed as assistant director W.C. Skuce, former supervisor of materials procurement, priorities, and inventory control for General Electric. By 1944, the CMP Division had 145 employees and an estimated budget of $600,000. Later in 1943, Julius Krug, took over as division head. Krug, a thirty-six year old public manager had spent his entire career in government service, including a stint at the Tennessee Valley Authority [28].

CMP's Impact

When in July 1943, Harold Boeschenstein reported to WPB's executive committee on the plan's first month of full operation, he noted its success as "a mechanism for implementing decisions made at the policy level of the government." He also assured WPB directors that if policy decisions were "prompt and sure," then CMP gave "every promise of getting the right

materials into the right quantities of end products at the right time. The result will be not only good distribution of materials but also increased output of the products essential to victory" [6, p. 254]. Boeschenstein was correct. CMP's effectiveness as a method of implementation is clear.

CMP's contribution to lifting overall munitions output, however, is more difficult to measure. This is so because of the range of variables involved in production changes--in capacity expansion, technological innovation, variation in labor productivity, and sudden alterations in military programs. CMP's contribution is also difficult to estimate because aggregate munitions production had leveled off by the time the plan became fully operational. The dollar value of munitions production in 1944 surpassed 1943, but it is likely that "for sheer physical volume, output in 1943 may well have surpassed that of any other year of the war" [7, p. 115]. Ironically, the infamous PRP guided metals distribution during the nation's steepest production increases. It is likely, however, that insofar as metals distribution gained flexibility under CMP, government planners could more easily shift supply among military programs [15, p. 124].

The plan's impact on specific materials producers is clearer. Reports from WPB Materials Divisions were uniformly positive. Since these divisions drew industry advisory committees and personnel into their work, we can assume these observations reflected private supplier opinion.

Major metal producers liked CMP's coherence as a planning system. The WPB Steel Division claimed that with CMP it could more accurately balance raw materials and melting capacity, with capacity in the finishing mills, a problem which had previously confounded both company managers and their colleagues in WPB's steel branch.

CMP administration also compelled more effective reconciliation of supply and demand by individual product. The Requirements Committee made final allotments for controlled materials in terms of total tonnage--of carbon and alloy steel in the case of steel--but that tonnage came to be based on finer analysis of specific product needs. The aluminum division, for example, in order to plan fabricating facilities and to make its recommendations of allotments to claimant agencies, demanded more precise statements about the quantities of specific aluminum forms, alloys, sizes, and shapes [29].

Under CMP, meetings on orderly distribution became pervasive across government agencies, a major strength of the plan from the perspective of central administration. Its operation compelled dialogue among potentially competing governmental organizations. This was true of policy discussion--and bitter battles--among claimant representatives in the Requirements Committee. It was also true at lower levels of administration. Operating branches of the materials divisions met their opposite numbers in claimant agencies to assess performances and settle disputes. CMP operations produced a lattice work of committees across WPB and military agencies.

In contrast to supplier opinion, which was enthusiastic from the start, major defense manufacturers initially gave CMP mixed reviews. Confusion during the second-quarter start-up--the transitional period--brought complaints from both Detroit and West Coast aircraft manufacturers. As

prime contractors they were responsible for gathering information from sub-contractors. Inauguration of CMP for them meant, "Christ, More Paper." Representatives of GM, Chrysler, Ford and Borg-Warner, who went public with their criticism in March 1943, cited continuing imbalance between allotments and production schedules, as well as general delay in material allotments. West Coast aircraft manufacturers agreed. Their collective complaints suggested a need for improved coordination decision-making among WPB's steel, aluminum, and copper divisions [3, pp. 19-20; 17, p. 27].

The initial skepticism eventually subsided. An advertising blitz helped. So did a series of CMP clinics in major industrial centers and subsequent operational adjustments designed to meet industry complaints. Detroit's resistance to paper work, for example, may have convinced Eberstadt to make materials allotments on a quarterly rather than monthly basis as first proposed.

In April 1943, after an extensive field trip to defense contractors in the New York-New Jersey region, CMP division officials claimed that materials procurement for inventory had "virtually disappeared" [19]. In May, after on-site visits to Remington Arms, Worthington Pump, Singer, Sperry, Bendix, International Harvester, Lincoln Electric, and other manufacturing plants, investigators reported that, "the benefits to be derived from advanced planning were universally evident and cannot be overemphasized. The practical guarantee of material delivery when authorized controlled material orders are accepted by the mills has proven to be one of the most outstanding features of the plan. Already there is a general attempt on the part of manufacturers to reduce inventories and guarantee end product deliveries with a greater degree of assurance." Bills of Material were sloppy, especially among sub-contractors, and debate persisted over which manufactured products to bring under CMP procedures. But those responsible for CMP in individual plants were found to be knowledgeable, and although company officials had been forced to appoint extra administrative personnel, "they feel that such will be justified by the economies of peace-time operations" [27; 20, pp. 55ff].

By July 1943, approximately 70% of all controlled materials flowed under CMP. Washington distributed the bulk of the nation's steel, aluminum, and copper to centrally approved military and civilian production programs. Firms without affiliation to a prime contractor, and without materials allotment numbers under CMP, could face hard times. But firms with defense sub-contracts could finally count on steady materials flows. In February 1944, *Business Week* reported that "even CMP's critics agree that it has hung up an impressive record since it went into operation in April 1943. It has not proved the answer to all production problems, as some of its sponsors hoped, but it has become the mainspring of WPB's control system" [2, p. 21].

Conclusion

CMP represents an unprecedented experiment in national administrative control. As a system for decision-making it linked action in

four areas: national production goals; specific military programs; supply-demand balances of critical materials; and plant production schedules. As a managerial system it combined coordinated central policy making with decentralized operations. As an operational system it combined central materials accounting control with comparatively flexible use of allocated materials budgets among claimants. CMP gave organizational content to the idea of the wartime industrial economy as a multidivisional firm.

As an experiment in central planning, CMP operated through vertically integrated firms and not through associations of producers and industrial consumers organized along cartel lines. It linked them--both the suppliers and consumers of critical war materials--into an even larger vertical chain on a national scale. At the apex of this vertical chain, as Eberstadt had explained in November 1942, stood WPB's Requirements Committee. Had the United States possessed either a structure of cartel-based industrial organization, or a group enterprise along Japanese lines, it possibly would have followed an alternative organizational path to metals allocation. The point deserves consideration.

Eberstadt himself touched upon the cross-national dimension during his press conference in November 1942. A reporter questioned him on how CMP compared to the plan used in Germany. Eberstadt responded that "the most fundamental difference . . . lies in the fact that they do not enjoy the advantages of quite so strict an antitrust law as we have here. Their industries are permitted to combine--in fact, have been encouraged to combine for many years--so that in the industry group they have a cell which is able to take on very great burdens of distribution."

Then he added, less discretely: "We, unfortunately, do not have that at the moment; therefore, we have to devise a mechanism which is a little bit more complicated, if you will, and certainly much newer than theirs. But, basically, the reports of their plan, which I have read and studied in connection with this, meet the same requirements that this plan does--the schedule--and, in addition to the schedule, I would like to emphasize, gentlemen, among other things, what this plan does is to force programs" [24].

Two specters had haunted CMP from its inception, and they may have made the U.S. system "a little bit more complicated" than Eberstadt might have liked. On the one hand, the vision of cartelization under the New Deal's National Industrial Recovery Administration (1933-1935), a model popularly associated with the German business experience, alarmed those who remained wedded to the competitive ideal, even in wartime. This ideal in political terms translated into demands for small business opportunity and anxiety over competitive markets in postwar America. The earliest attempts to impose administrative control, including PRP in its early stages, were accompanied by one of the fiercest and longest running antitrust crusades in the country's history. The crusade persisted into the spring of 1942, and it shaped subsequent mobilization procedures for coordination and control.

A concerted drive to stamp out cartels lay at the heart of this campaign. Cartels, antitrusters claimed, had subverted economic recovery from depression, and confounded attempts to accelerate industrial

production for war. In some instances they were a result of prewar patent and licensing agreements with German firms. From this perspective, government could not give authority for managing war production to business enterprise. There could be no more NRAs. In the fall of 1942, as the Kanzler Plan for Materials Scheduling reached the public press, *Business Week* predicted "plenty of outside opposition." "Labor, the New Dealers, the Truman Committee (a Congressional investigation committee chaired by Senator Harry S. Truman) will be deeply suspicious of a scheme which smells of military dominance and, by throwing most of the control of industry into the hands of the big contractors, also smacks of NRA" [13, p. 17; 25, pp. 430-33].

Accountability also had to be to civilian rather than to military organizations, because the second specter that haunted CMP was a Nazi or fascist military state. Organizing industrial war production exclusively under military command was simply beyond the ideological pale in a democracy with a historic suspicion of both central military and economic power. This was so even though contracting authority placed great economic power in military hands.

U.S. metals distribution, therefore, could not be organized around decentralized industrial or industrial-military groupings such as the production rings characteristic of Germany or the zaibatsu and Industrial Control Associations characteristic of Japan. Nor could it rest in military units. It is this kind of ideological and political context that helps to explain why Nelson imposed the so-called horizontal approach to metals allocation in the spring of 1942. Despite its weaknesses, that scheme at least retained control of metals distribution in civilian, WPB hands.

But it proved insufficient. Washington required a plan that could combine central, civilian control with decentralized, operating responsibility to both large-scale corporate enterprise and military organizations. In the end, Eberstadt's answer--and ultimately America's answer--was, through CMP, a variation on the vertically integrated, multidivisional form [11, pp. 201-217]. It was an attempt in wartime to combine central policy making at the apex with decentralized responsibility through claimants agencies and their prime contractors, with materials accounting techniques providing one means of retaining overall control. The irony may well be that by late 1943, as a result of CMP, more central industrial control had become available to governmental administrators in the U.S. economy than to the governments of its major enemies.

References

1. John E. Brigante, *The Feasibility Dispute* (Washington, DC, 1950).
2. *Business Week*, February 12, 1944.
3. *Business Week*, March 27, 1943.
4 Calvin Lee Christman, "Ferdinand Eberstadt and Economic Mobilization For War, 1941-1943," Ph.D. diss., Ohio State University, 1971.
5. Civilian Production Administration, *Industrial Mobilization For War, History of the War Production Board and Predecessor Agencies 1940-1945*, Vol. I (Washington, DC, 1947).

6. Civilian Production Administration, *Minutes of the War Production Board* (July 6, 1943).
7. Robert W. Coakley and Richard M. Leighton, *Global Logistics and Strategy 1943-1945* (Washington, DC, 1968).
8. "Committee on Materials Control Plan" (Meetings, Sept.-Oct. 1942), Papers of Julius Krug, Box 100, Manuscript Division, Library of Congress, Washington, DC.
9. Robert H. Connery, *The Navy and the Industrial Mobilization in World War II* (Princeton, NJ, 1951).
10. Eberstadt to Ernest Kanzler, September 20, 1942, Papers of Robert Patterson, Box 115, Manuscript Division, Library of Congress, Washington, DC.
11. Louis Galambos and Alfred D. Chandler, Jr., "The Development of Large-Scale Economic Organizations in Modern America," *Journal of Economic History,* 30 (March 1970).
12. Charles J. Hitch, "Controlled Materials Plan," Records of the War Production Board, Record Group 179, file #147, National Archives, Washington, DC.
13. "The Kanzler Plan," *Business Week*, September 19, 1942.
14. Paul A. C. Koistinen, "Warfare and Power Relations in America: Mobilizing the World War II Economy," *The Home Front and War in the Twentieth Century* [Proceedings of the Tenth Military History Symposium USAF Academy 1982] (Washington, DC, 1984).
15. Alan Milward, *War, Economy and Society 1939-1945* (Berkeley, CA, 1977).
16. *New York Times*, November 3, 4, and 7, 1942.
17. *New York Times*, March 13, 1743.
18. David Novick, Melvin Anshen, and W. C. Truppner, *Wartime Production Controls* (New York, 1949).
19. David Novick to Julius Krug *et al.*, May 20, 1943, Krug Papers, Box 101.
20. David Novick, "Accounting and Record Keeping Under CMP," *Purchasing*, 14 (March 1943).
21. Mark Perlman, "Political Purpose and the National Accounts," in William Alonso and Paul Starr, eds., *The Politics of Numbers* (New York, 1987).
22. Robert Perez and Edward F. Willett, *The Will to Win: A Biography of Ferdinand Eberstadt* (Westport, CT, 1989).
23. Richard Polenberg, *War and Society, The United States 1941-1945* (Philadelphia, 1972).
24. "Press Conference of Donald Nelson and Full Text of Controlled Materials Plan," November 2, 1942, RG 179, File 147.04P.
25. Jordan A. Schwarz, *The Speculator, Bernard M. Baruch in Washington, 1917-1965* (Chapel Hill, NC, 1981).
26. R. Elberton Smith, *The Army and Economic Mobilization* (Washington, DC, 1959).
27. "Summary and Detail Reports of Plant Visits Made Week of May 16th," Krug Papers, Box 102.
28. "WPB, Office of Vice Chairman, Deputy Director General for Staff, Distribution Bureau, CMP Division Budget Estimate for Fiscal Year 1944." n.d. RG 179, File 063.103R.
29. "WPB Supplemental Budget Hearing, January 9, 1943, Aluminum and Magnesium Branch," January 9, 1943, Papers of V. O. Key, Box 24, John F. Kennedy Library, Boston, MA.