REPORT ON THE VALVE AND FITTINGS INDUSTRY PRODUCTION FOR THE WAR EFFORT

War Production Board - Shipbuilding Division
Valve and Fittings Section

October 10, 1944

Valve and Pipe Fittings Industries Have Met War Demands with Greatly Expanded Production

Before the war broke out, many valves and pipe fittings were generally and properly considered as shelf goods. Distribution of products to the ultimate user was to a large extent through jobbers and distributors. Due to the availability of valves and fittings, users were not accustomed to ordering their requirements well in advance of actual needs and frequently were not very accurate in estimating their requirements in advance of such needs. Why worry about accurate estimates when any shortages developing near completion of construction could be covered by buying "from stock".

The very erroneous impression existed in the minds of the public that valves and pipe fittings were primarily plumbing and heating components; that the major production of the valve and fittings industries was used for plumbing and heating purposes; and that the production of these industries was not essential to the war effort and should be curtailed. Unfortunately, in the absence of firm requirements from the war agencies this impression also existed in the minds of some of those in Government who were responsible for authorizing allotments and use of raw and other materials. As a result of that early policy, production of valves for the war effort was retarded when it should have been increased by leaps and bounds.

Another early serious error was the policy of allotting raw and semi-fabricated materials only after manufacturers had received actual orders for their products. In those days, evidently little thought was given to the time cycle involved in obtaining semi-fabricated steel and other products from the mills and foundries when the supply fell far short of the demand and the subsequent time cycle of manufacturing processes required to produce valves and fittings. Eventually this problem was recognized by those in charge of allotments. Critical segments of the industry were given special dispensations to receive 100% of all materials required and also to receive allotments a year in advance. High priority ratings were assigned. All these factors had a direct effect in helping to increase production.

Another early obstacle in the path of increased and efficient production was the fact that valve and fittings companies reported to several OPM branches and later, WPB divisions whose policies on matters, such as allotting materials, assignment of ratings, etc. varied widely. Different kinds of valves had been assigned to Industry Divisions according to the ultimate end use of the valves although all these different kinds of valves were usually made in the same plant. This diverse control handicapped the Industry. A uniform policy or central direction was lacking. This situation was corrected on September 22, 1942 when the Shipbuilding Division of WPB was given jurisdiction over practically all valves and pipe fittings for industrial and marine use.

Some manufacturers refused to believe or could not foresee that large quantities of valves and fittings for war needs would be ordered according to certain specifications. They were of the opinion that their products

would be purchased "as is". Many of these manufacturers later conformed their products to the prevailing specifications. All in all, however, the valve and pipe fittings industries in close cooperation with the Government added another war production miracle to the list of accomplishments of American industries.

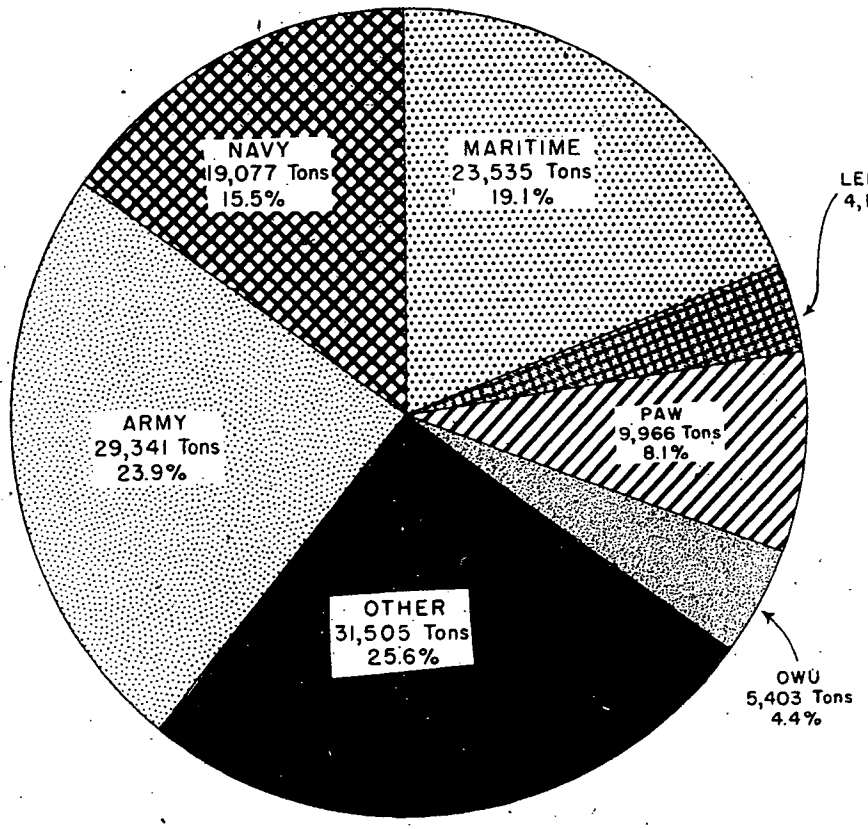
Where Valves and Pipe Fittings are Used Today

It is true, but not generally known or believed, that a very small part of valve production is used in connection with plumbing and heating systems in homes, hotels, apartment houses, office buildings, or what is now termed civilian installations. It is true, but not generally known that almost half the entire output of the industry for the year 1943 and the first eight months of 1944 has been absorbed in ship construction. Enormous quantities have also been used in synthetic rubber and high octane gasoline plants, pipelines and Army projects. Lend-Lease takes a substantial percentage with public utilities also in the forefront. In peacetime, industrial maintenance and repair required a sizable portion of total tonnage and still does, but on a percentage basis, industrial maintenance and repair through the war period, has been low. Civilian requirements (homes, apartments, offices, stores, hospitals, etc.) considered essential are negligible, possibly less than 2% of the tonnage production of the Industry. Valves and fittings truly hold an important, but often inconspicuous place, not only in our daily lives but in our fighting ships, our commerce by land, sea and air, our public welfare, our raising of living standards and our scientific progress. Of necessity, valves and fittings serve man from the cradle to the grave. Generally speaking, there is no substitute for a valve.

The following charts show the distribution of iron valves, bronze valves, steel valves and steel pipe fittings to the principal Claimants for the years 1943 and 1944. The 1944 distribution is based on the reported shipments for January through August plus the scheduled tonnages for the remainder of the year.

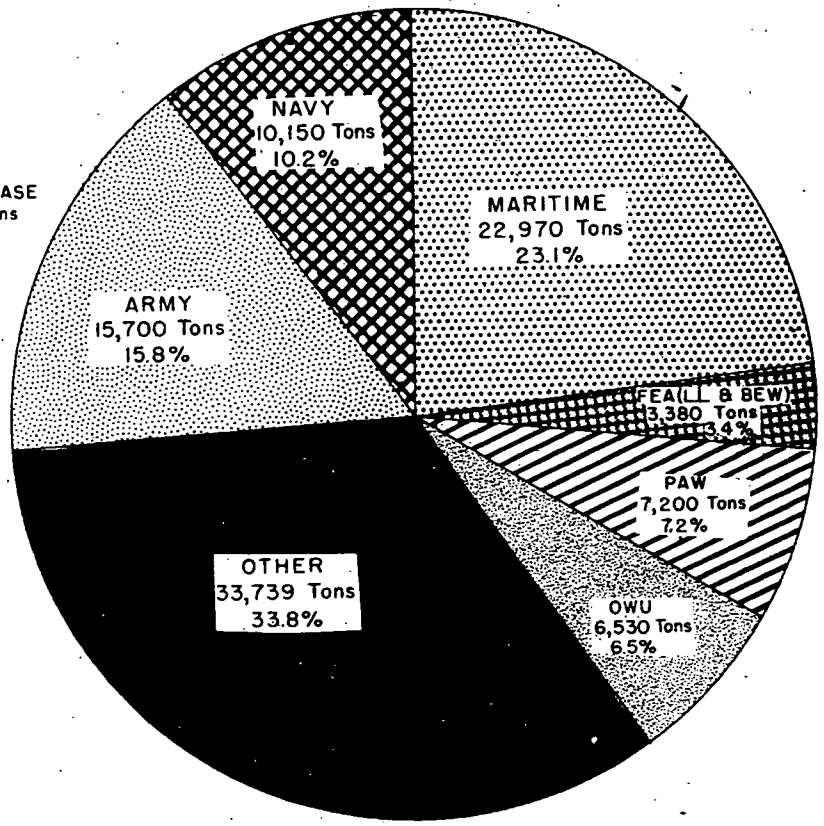
IRON VALVES
SHIPMENTS TO PRINCIPAL CLAIMANTS
1943 and 1944

1943



TOTAL = 122,949 Tons

1944
(Shipments January Through August plus Scheduled Orders)



TOTAL = 99,669 Tons

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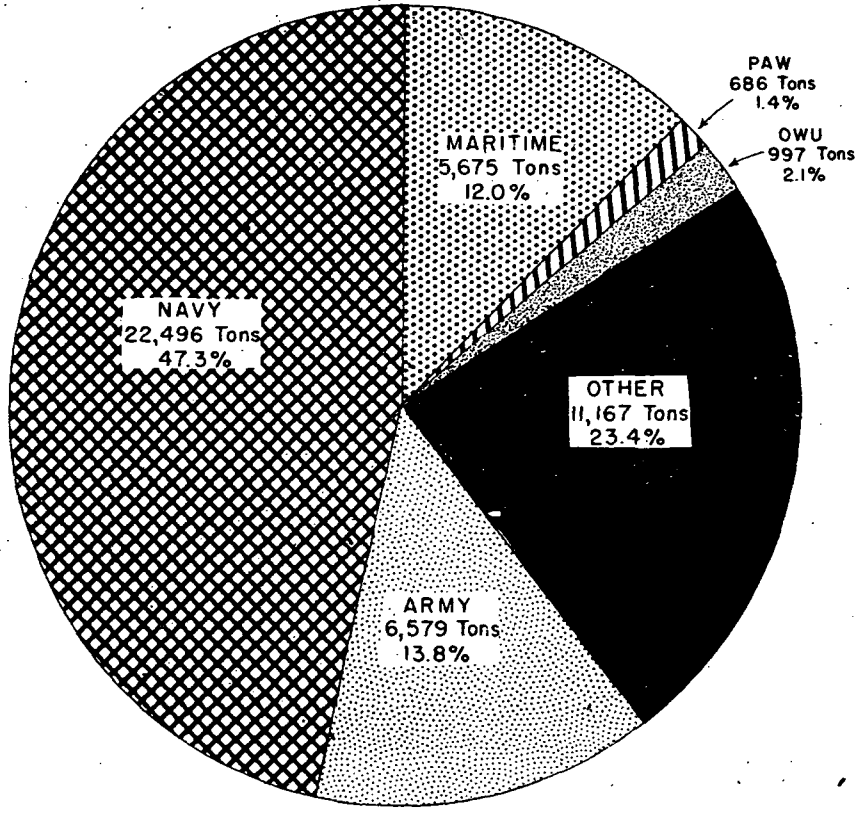
BRONZE VALVES

SHIPMENTS TO PRINCIPAL CLAIMANTS

1943 and 1944

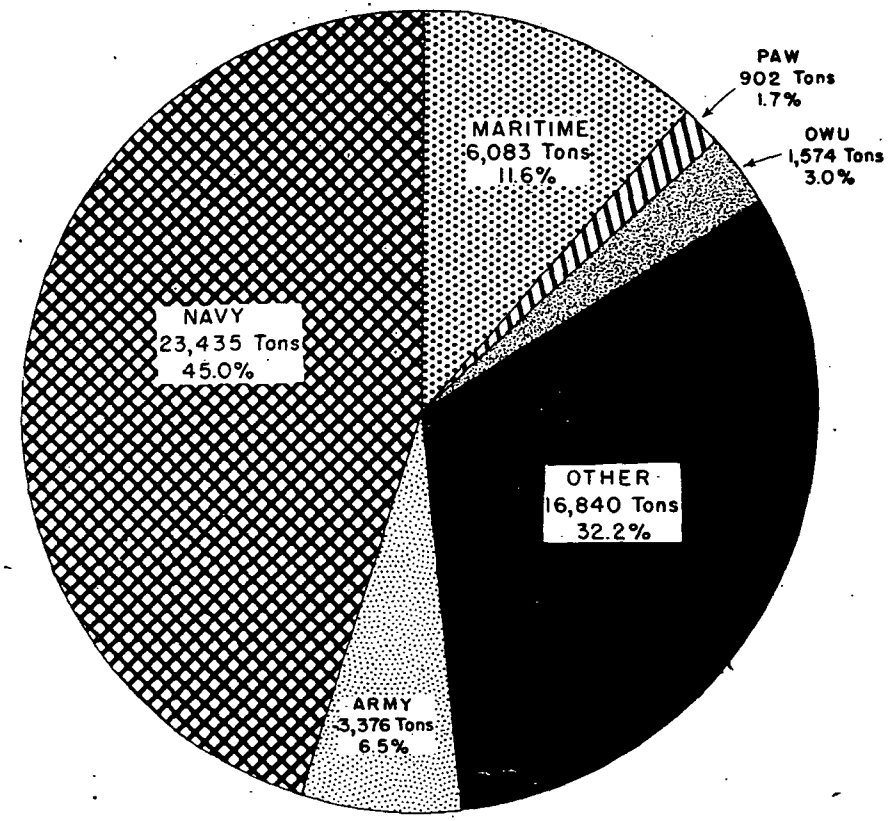
1943



TOTAL = 47,600 Tons

1944

(Shipments January Through August plus Scheduled Orders)



TOTAL = 52,210 Tons

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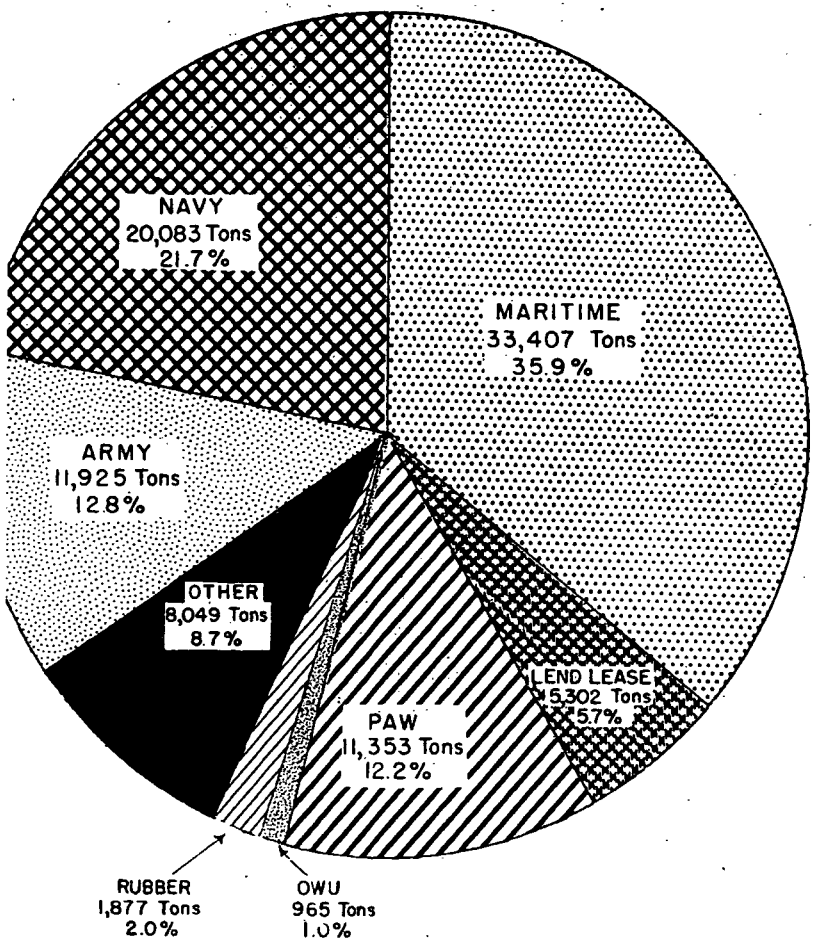
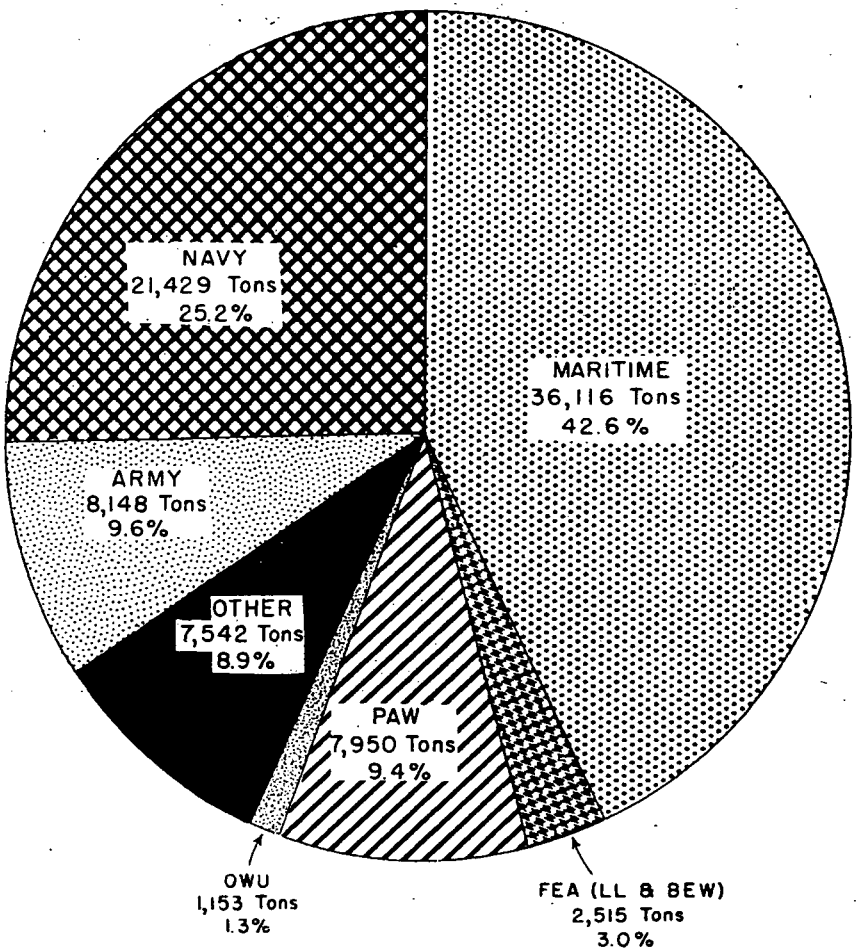
STEEL VALVES
SHIPMENTS TO PRINCIPAL CLAIMANTS
1943 and 1944

1943



TOTAL = 92,961 TONS

1944
(Shipments January Through August plus Scheduled Orders)



TOTAL = 84,853 TONS

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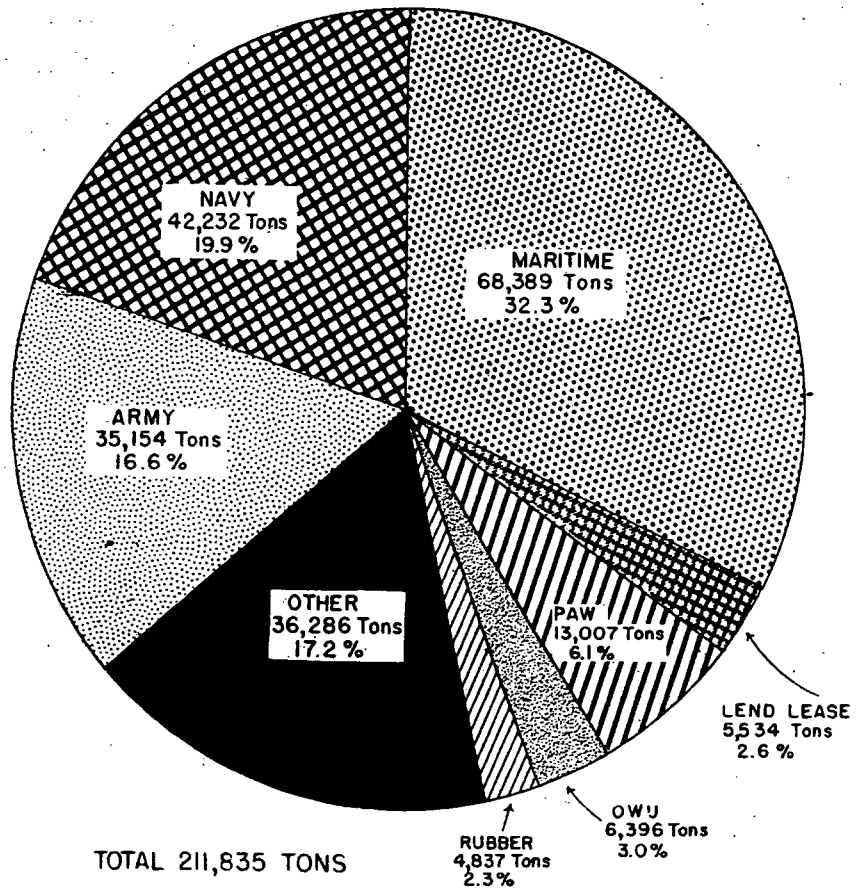
STEEL PIPE FITTINGS

SHIPMENTS TO PRINCIPAL CLAIMANTS

1943 and 1944

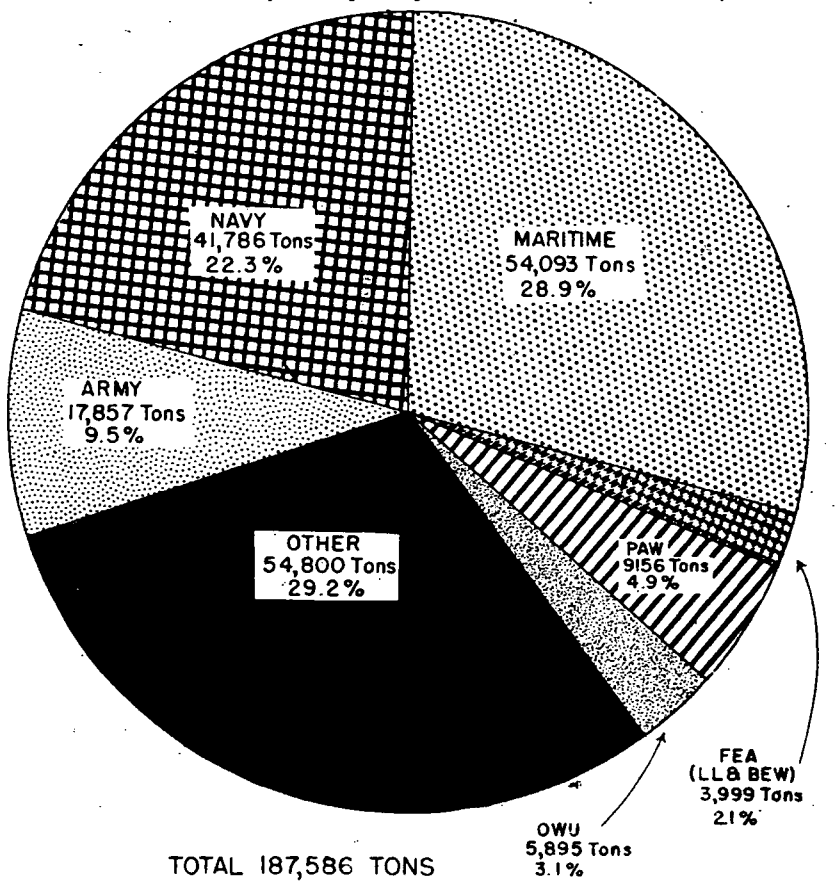
1943



TOTAL 211,835 TONS

1944

(Shipments January Through August Plus Scheduled Orders)



TOTAL 187,586 TONS

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Critical Shortages Foreseen by Industry Before Pearl Harbor

Seven months before Pearl Harbor, or to be specific, on May 5, 1941, a group of steel valve manufacturers visited the authorities in Washington (Shipbuilding Division, Office of Production Management) and warned that unless an immediate expansion of the steel valve industry was started, a serious shortage of steel valves would inevitably follow. In other words, the existing capacity was insufficient to meet increasing demands of the defense program. This position of the steel valve industry was based on the then known demands of the defense program, and not a war program. Pearl Harbor was still seven months away and the overwhelming deluge of demand following that eventful day was not dreamed of at this May 5, 1941 meeting. Following this meeting, an advisory committee was formed to make studies and submit recommendations as to how to meet the impending shortage. The May 5th meeting was followed quickly by meetings on May 9, May 19 and June 4. These were attended by representatives of Government Agencies, including the Navy and Maritime Commission, as well as valve companies. Certain conclusions were reached at the June 4 meeting. Estimates were developed as follows:

Estimated unordered requirements of steel valves for the balance of 1941	8,880 tons
Estimated capacity for balance of 1941	7,193 tons
Estimated shortage in capacity for balance of 1941	1,687 tons

Representatives of the Industry were polled as to how this deficit could be met, which brought forth the following needs or shortages:

Manpower	- - Needed by 90% of Industry
Machine Tools	- - Needed by 69% of Industry
Foundry Capacity	- - Needed by 26% of Industry

The question of subcontracting was discussed and manufacturers were urged to give this phase of the problem their most serious consideration. At a later meeting on July 2, 1941, it was reported that from 25% to 50% of the steel valve production was already being "farmed out" or subcontracted. This included the purchase of castings from outside sources. At this same meeting, the committee forecast 12,205 tons of steel valve requirements for the last six months of 1941, arrived at as follows:

Navy (ship construction)	- - 3,390 tons
Maritime Commission	- - 2,485 tons
Public Utilities	- - 840 tons
Pipelines	- - 1,500 tons
All Other	- - 3,990 tons
Total	12,205 tons

Who would have imagined at that time that essential steel valve requirements would mount to the amazing total of 100,000 tons for the year 1943! Still more incredible, who in the Industry or Government would have believed that this requirement would be met!

Industry Advisory Committee Authorized by Attorney General on July 30, 1941

The Steel Valve Industry Advisory Committee was the first industry advisory committee legally authorized within the Office of Production Management. The Committee held its first meeting on August 4, 1941 to discuss Navy and Maritime steel valve needs for the balance of 1941 and for the years 1942 and 1943. Estimates submitted for 1942 and 1943 by the Navy and Maritime Commission were as follows:

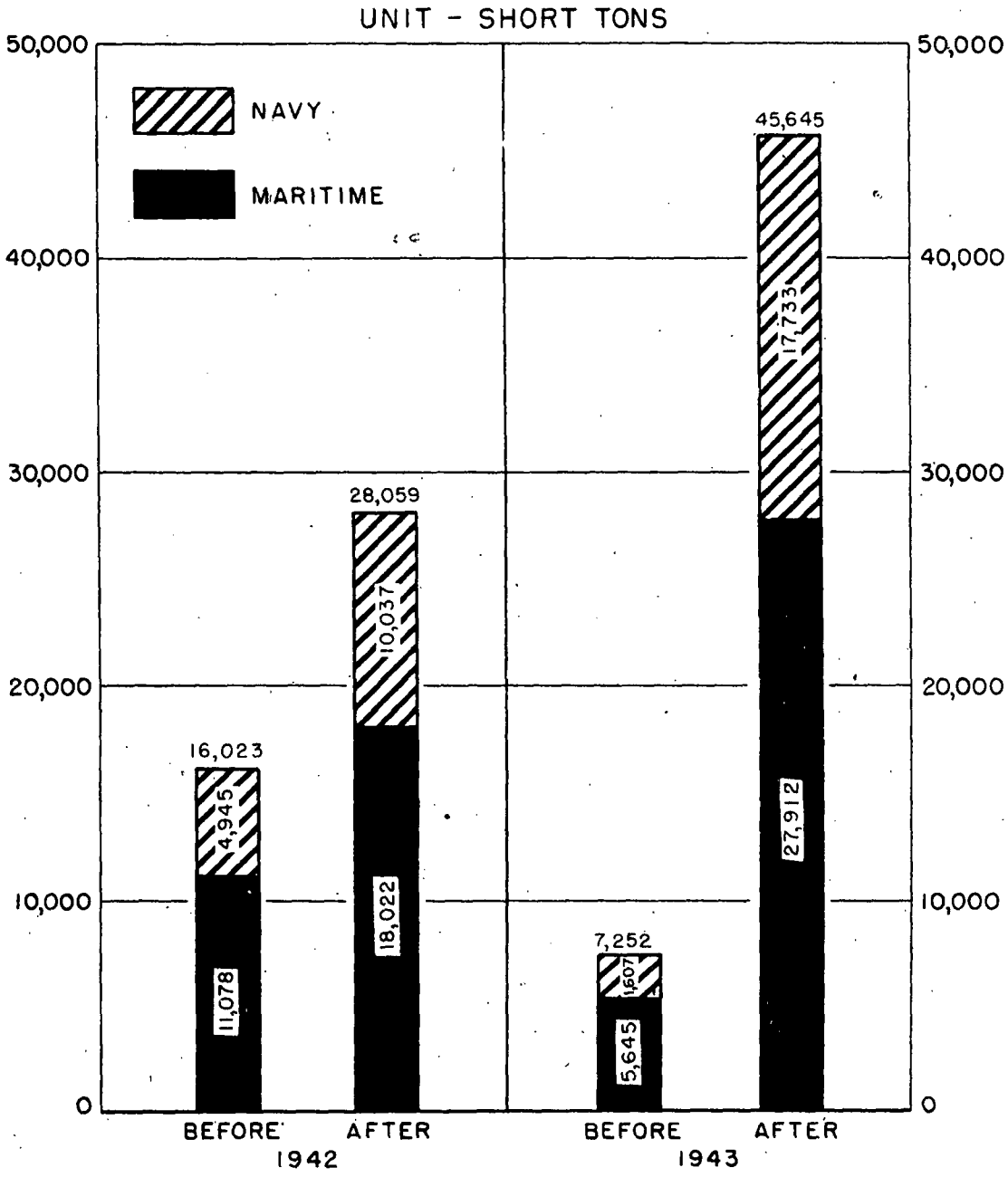
Year	Navy	Maritime	Total - Tons
1942	4,945	11,078	16,023
1943	1,607	5,645	7,252

Of course, Pearl Harbor knocked these steel valve requirements into a "cocked hat". Actually, the final requirements were:

Year	Navy	Maritime	Total - Tons
1942	10,037	18,022	28,059
1943	17,733	27,912	45,645

A comparison of these figures is shown graphically on the following chart.

ESTIMATES OF REQUIREMENTS OF STEEL VALVES MADE BY NAVY AND MARITIME COMMISSION BEFORE AND AFTER PEARL HARBOR



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Thus the requirements for steel valves increased after Pearl Harbor by the following percentages, for Navy and Maritime Commission

Year	Navy	Maritime	Total
1942	103%	63%	75%
1943	1000%	395%	530%

The Navy's actual needs for 1943 were ten (10) times larger and the Maritime Commission's needs for 1943 approximately four (4) times larger than anticipated or realized on August 4, 1941. This comparison may not leave a very deep impression on the casual reader, but the impacts of hundreds of thousands of purchase orders that followed have left indelible impressions on those responsible for meeting these war demands.

There was a prevailing feeling that pipelines, public utilities, ordnance plants and shore facilities (Navy) might be needing large quantities of steel valves. The Committee recommended that the steel valve needs of these users and others be ascertained by the Government and then be presented at a future meeting. This meeting was held on September 9-10, 1941. Even at this meeting, the magnitude of the job ahead was not fully realized although the valve manufacturers had far better estimates of future requirements than did the users themselves, as proved by later experiences and records. The steel valve manufacturers estimated their yearly capacity at 27,000 tons. They actually produced 27,068 tons in 1941.

The Committee was asked to estimate total defense requirements based on their experience and knowledge of defense orders for 1942. The following requirements were submitted:

1942 Steel Valve Requirements

Description	Tons	% of Total
Navy	5,000	13
Maritime Commission	11,000	30
Shore Establishments	3,000	8
War Department	1,250	3
Refineries and Pipelines (not including defense pipelines)	7,500	19
Utilities	8,000	21
Defense Industries	2,500	6
Total	38,250	100

A requirement of 38,250 tons for 1942 placed the Industry in the position of facing a deficiency in capacity of well over 10,000 tons. Although this requirement loomed large and there were those who couldn't believe this astronomical figure, the industry was destined to produce a much larger tonnage and did produce 53,354 tons of steel valves in 1942. Even so, this production did not entirely meet all requirements.

Expansion of the Industry

At the eventful meeting in September, 1941, the Committee proposed that the Industry be expanded to increase annual production by 14,640 tons of which 9,640 tons were to be produced in 1942. Such an expansion was estimated to cost $15,000,000 of which $10,000,000 was to be financed by Government and $5,000,000 by private industry. It was contemplated that all steel valve producers would participate in this proposed expansion, thus enabling the Industry to utilize all of its resources in expediting the operation of additional facilities. A program of expansion was approved by the Shipbuilding Division and negotiations were immediately undertaken with the Navy Department to finance a large part of this program.

After our entrance in the war, the greatly increasing demands for valves from the Army and Navy, the Maritime Commission, synthetic rubber and high-octane gasoline programs and others, necessitated an additional expansion estimated to cost $10,000,000. Recommendations by the Industry were made on July 1, 1942, and approved. Up to the present time, the valve and fittings industries have expanded plants and facilities to the extent of approximately $38,404,000. Of this amount $19,948,000 or 52% was financed by the Government and $18,456,000 or 48% was privately financed by the manufacturers.

Machine Tool Dilemma

There was no difficulty in getting this expansion program approved and financed. BUT — what good was an expansion on paper if not supported and followed through with new buildings and machine tools? Although most of the orders for machine tools for the first expansion were placed in December, 1941 and early in 1942, the preference ratings and urgency standings were found in many cases to be too low to obtain delivery -- and later found to be so low that no satisfactory or definite delivery dates could be obtained. Preference was given to construction for other war purposes such as plants for tanks, planes and ordnance, but it evidently was not realized that such plants could not operate without valves. Many valve companies did not require new buildings, but needed machine tools only. These companies could have increased production immediately if they had obtained their needed tools. Late in 1942, promised deliveries of bottleneck machine tools looked more encouraging. Higher preference ratings had been obtained after much delay, negotiation, persuasion and pleading. Then came the "bolt from the blue" — literally and figuratively speaking — in the form of an Aircraft Overriding Directive issued in December, 1942. Valve demands were continuing to increase at an alarming rate while promised deliveries of these "will-of-the-wisp" machine tools were set back many months. As late as February, 1943, there were still 278 tools long overdue on order. By May, 1943, the Navy succeeded in making effective, a new urgency list which included valve companies, but the Aircraft Directive still held the preferential position. By this time, the clamor for valves could be compared to the advertisement for a well-known alarm clock — "First it whispers, then it roars". Non-delivery

of bottleneck machines, such as grinders, multiple spindle drills, boring mills, cross sliding turret lathes and radial drills can be charged as the most direct reason why the Industry was unable for a considerable period to supply valves in required quantities at required times.

Material Shortages -- A Jig Saw Puzzle

The valve and pipe fittings industries are relatively small users of metals when compared with all metal using industries. But, it is essential for a manufacturer to receive a "balanced ration" of materials to produce efficiently. If unequal cuts are made in allotments of different materials, the production schedule is definitely and decidedly thrown out of gear. The pieces of this materials jig saw puzzle must fit; otherwise the production picture would look like those distorted reflections in an amusement park mirror.

Prior to September, 1942 when several WPB divisions were processing applications of valve manufacturers for materials, varying percentages were used in allotting materials and a distorted production picture was the result. Severe cutbacks in manufacturers' requests for materials were made partly because the erroneous impression existed in too many quarters that valves were primarily used for plumbing and heating. It seemed unbelievable to many that more than half the valve and fittings production of the Industry was going into ships alone. Preference ratings given with allotments were often so low that purchase orders in mill schedules were in relatively low positions with no hope of being filled in the near future. As late as the fourth quarter of 1942, the Requirements Committee due to the overall excess of demand over supply, cut valve manufacturers' requirements of stainless steel to 50% and copper base alloy to 67%. This had a decided effect on production.

In 1941 and early in 1942, the Industry Advisory Committee recommended time and again that a small pool of alloy steel be made available to those manufacturers receiving orders requiring this material. Support was given to this request by the Shipbuilding and Power Divisions but as this meant an overriding priority for valve requirements in the face of a then shortage of alloy steel to meet the war program requirements, these requests were denied.

In 1941 and through 1942, the attitude of many of those responsible for allotting materials was to base allotments on actual purchase orders held by manufacturers. The fact that large war construction projects were on the drawing board today and in stages of construction tomorrow, did not carry any weight when valve manufacturers requested materials to produce valves in anticipation of orders certain to follow.

The Shipbuilding Division, after being charged with the responsibility for all valves and pipe fittings, worked very closely with the Steel and Copper Divisions and adequate allotments were obtained. Delivery schedules of materials were improved. The second quarter of 1943 (the first quarter under CMP) marked

the beginning of a decided improvement in the materials situation. Hundreds of tons of critically needed valves would not be awaiting completion because of the lack of component parts, such as alloy studs, bolts and nuts. Manufacturers' plants would not be within 24-hours of stopping operations because of a lack of materials or an authorization to use materials. The "top side" of WPB ordered full speed ahead on valve production and assured the manufacturers that critical materials would be provided for all essential needs.

Appointment of Production Consultant for Valve and Fittings Industry

It became apparent that a qualified and experienced valve and fittings production manager could well be selected as a Production Consultant to bring up production in individual plants to the highest standard of any in the Industry. The Industry was asked to submit nominations for such a Production Consultant who would confer with the Industry and submit to WPB recommendations for increasing production in individual plants and related problems. However, there were practical difficulties in obtaining the qualified man since all qualified valve production men were busy producing valves and there was doubt as to the accomplishment that would be possible under the conditions in the valve industry. After consideration of all factors involved, the Industry nominated the President of one of the largest valve and fittings companies, who accepted this appointment on March 1, 1943.

The Production Consultant has conferred with representatives of the Industry or segments of the Industry at frequent intervals to bring production to requirements and related matters. His advice and assistance have been most valuable to the Shipbuilding Division, WPB.

Increasing Production and Conserving Critical Materials Through Limitation Orders

Before the war, there were more than 35,000 basic varieties and sizes of valves and pipe fittings. It has been estimated that with the special facings and trimmings requested and supplied by the Industry prior to the war, the total varieties and sizes would reach a total of 200,000. A fertile field existed for increasing production and conserving critical materials through simplification, standardization and substitution.

Three Limitation Orders affecting the products of the valve and pipe fittings industry were developed and are under the jurisdiction of and administered by the Shipbuilding Division. They are:

Order L-288 - covering grey cast iron, malleable iron and brass or bronze pipe fittings
Order L-252 - covering valves and valve parts
Order L-278 - covering steel pipe fittings

The overall purpose of these orders has been to increase production by simplification of lines and restrictions on certain features of design and

to conserve critical materials, such as copper base alloys, tin, nickel, aluminum, and alloy steels. A summarized history of the development of the three Limitation Orders follows.

Order L-288 - Grey Cast Iron, Malleable Iron and Brass or Bronze Pipe Fittings

In the early part of 1941, a survey of the pipe fittings industry disclosed that over 8500 kinds, types and sizes of pipe fittings were being regularly offered by the Industry, and that the demand was concentrated on about 3000 items. Continued stocking of the other 5500 items tied up considerable material in finished inventories and complicated the productive processes with thousands of short runs. In cooperation with The Pipe Fittings Manufacturers Association, and at the request of the Office of Price Administration and Civilian Supply, the National Bureau of Standards, Division of Simplified Practice, undertook the development of a simplified practice recommendation to improve the uneconomical production situation existing in the Industry. During the Summer and Fall of 1941, several meetings of representatives of the National Bureau of Standards and the pipe fittings industry were held as the recommendations were being developed.

The result of these efforts was the issuance of Simplified Practice Recommendation R185-42, Pipe Fittings, by the National Bureau of Standards, and effective January 1, 1942. The simplified schedule recommended the continued production for stock of but 1311 of the 4964 grey cast iron fittings previously offered; of 1169 of the 2331 malleable iron fittings, unions, and union fittings, and 487 of the 1271 brass or bronze screwed fittings, unions and union fittings. It was estimated that the retained 35% of the former number of fittings would satisfy 92% to 94% of all consumer demand.

Early in 1942, Simplified Practice Recommendation R185-42 was adopted by the War Production Board and promulgated as Schedule II of Limitation Order L-42, effective March 1, 1942. After that date, production of pipe fittings was limited to those permitted therein, with an exception provided for those fittings required for use on aircraft and watercraft other than pleasure craft.

Schedule II of L-42 was revised in the early part of 1943 and reissued as Limitation Order L-288. It is strictly a simplification order, and includes no metallurgical or design restrictions.

Order L-252 - Valves and Valve Parts

The history, including dates, of the development of Order L-252 closely parallels that of Order L-288. In this instance, the industry group cooperating with the Government organizations was The Valve Manufacturers Association.

Simplified Practice Recommendations R183-42 and R-184-42, covering bronze or brass valves and iron body valves, respectively, were issued by

the National Bureau of Standards, and made effective January 1, 1942. These recommendations were confined to a restriction only in the number of pressure classes in which gate, globe, angle and check valves should be carried in stock.

Again, the War Production Board adopted the Simplified Practice Recommendations and issued Schedule I of Limitation Order L-42 in February, 1942, limiting production to the pressure classes of valves permitted therein. This Schedule was made effective March 1, 1942.

In the late Spring of 1942, it developed that increased production in the valve industry was of vital importance to the war effort and that quantities of then critical materials could be saved in the manufacture of valves for land service. The Shipbuilding Division appointed a Valve Segment Committee of the Valve and Fittings Industry Advisory Committee to develop a limitation order that would increase production and conserve critical materials. In May, 1942, the first meeting of this Committee was held, and its work was completed in December, 1942.

On January 23, 1943, Limitation Order L-252 was issued and cancelled Schedule I of Order L-42. Order L-252 became effective May 1, 1943. It classified valves by design, by materials used, by pressure and by size.

When issued, an Industry study revealed that Order L-252 would reduce the number of items of gate, globe, angle, cross and check valves produced from 4079 to 2504. It was estimated that production of the Industry would be increased by 10% through this simplification. As to critical materials, it was expected the restrictions imposed by Order L-252 would save 1900 tons of copper and 4340 tons of alloy steel per year.

Order L-252 provides exceptions for certain services, notably valves for use on watercraft. The fact that valves ordered for ship production approached 50% of all those produced, led to certain relaxation in restrictions of Order L-252, which reduced slightly the expected savings in copper base alloy but more than offset this by increasing production through the adoption of a standard suitable for both ship and land service.

In addition to its restrictions which simplify lines and save critical materials, Order L-252 also prohibits certain features of design which it was thought could be dispensed with in land service without lowering valve service performance too drastically. Intent of such restrictions was to save man-hours and save critical materials.

Order L-252 covers practically all considerations involved in valve production - sizes, pressure class, types, design, standards and materials of parts.

Order L-278 - Steel Pipe Fittings

With Limitation Orders either in effect or in preparation covering brass, iron and steel valves, and brass and iron pipe fittings, it became apparent that an order should be prepared for steel pipe fittings. Many of the proposed restrictions placed on steel valves would, of necessity, be necessary for steel fittings to avoid confusion in design and erection of piping systems.

To meet this need, the Shipbuilding Division appointed a Fittings Segment Committee of the Valve and Fittings Industry Advisory Committee. Its first meeting was held in early September, 1942. The efforts of this Committee resulted in the May, 1943, issuance of Limitation Order L-278, made effective as of July 1, 1943.

Order L-278 was estimated to permit production of only 3615 of the 38,784 items of steel pipe fittings previously manufactured, yet serving 98% of general demands of purchasers. The Order, therefore, eliminated a great number of small runs which interrupted the "straight line" production methods basic in the Industry. A resultant 10% production increase was estimated, and this was of tremendous importance as steel pipe fittings were a critical component in the war program.

In addition to its simplification provisions, Order L-278 restricts use of critical materials, and estimated annual savings were 3500 tons of alloy steel, 175 tons of chromium, and 17.5 tons of molybdenum.

Changes in specifications of materials and of pressure classes imposed by Order L-278 correspond closely with those of Order L-252. Simplification resulted largely by permitting fewer size reductions and limiting types of flange facings.

General Effect of Limitation Orders

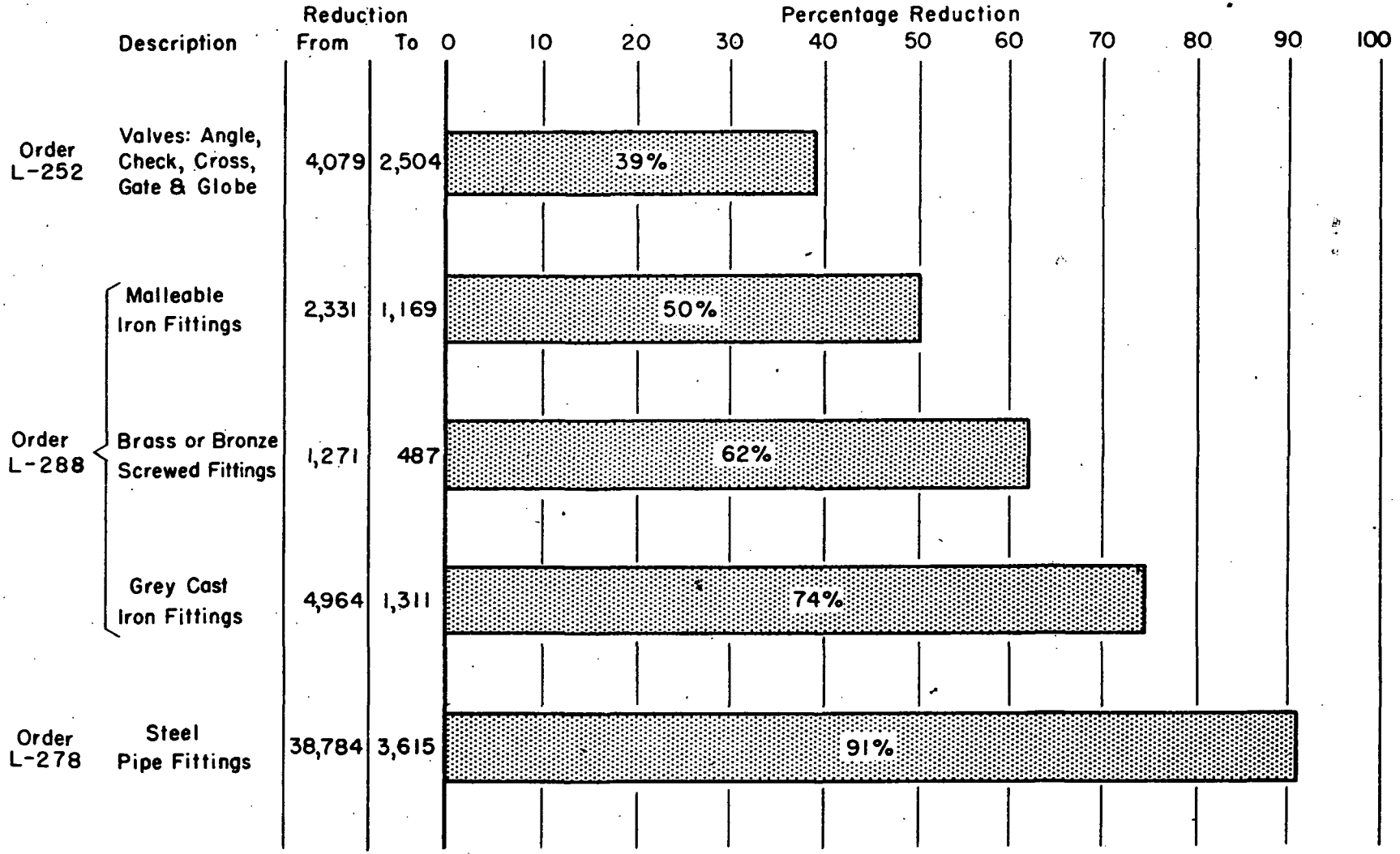
Restrictions on use of materials and designs have been complied with by the valve and pipe fittings producers generally, and objections raised by consumers have not been serious.

Restrictions pertaining to simplification have been followed to an amazingly large degree. Demands for odd sizes, discontinued pressure classes and types, special facings and non-standard items have been negligible.

Therefore, anticipated results from the three Limitation Orders of the Shipbuilding Division are presumed to have been actually effected.

The following chart shows the reduction in items which were catalogued and ordinarily carried in stock prior to simplification.

REDUCTION IN NUMBER OF VARIETIES AND SIZES OF VALVES AND PIPE FITTINGS EFFECTED THROUGH LIMITATION ORDERS L-252; L-278 AND L-288



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Production Increased by Extension of Subcontracting of Steel Valves and Valve Parts

In April, 1943, the principal manufacturers of steel valves were called to Washington for a two-day meeting to discuss extended subcontracting of complete valves and valve parts as it was apparent that this offered a quick and effective method of further increasing valve production. The requirements for the "must" destroyer escort ships, high-octane gasoline refineries and rubber projects being built simultaneously, had to be met. At that time, losses of ships were of paramount concern and emphasis was being placed on the production of more combat ships of the escort type to meet the submarine menace.

The Government realized that valves and parts produced in a subcontractor's plant would cost more than if manufactured by a regular valve manufacturer who was properly equipped with machine tools and who had the experience or "know how" of valve manufacture. It was known at that time that backlogs of certain machine tool builders were diminishing. The logical thing to do was to enlist their help as subcontractors. It was known also that the extension of subcontracting would require the guidance and supervision of the already overtaxed supervisory and engineering personnel of the regular valve manufacturers.

The method of absorbing the extra cost of work done by subcontractors was discussed and by mutual agreement, certain principles and procedures were accepted as being fair and operative. The Navy took the lead in implementing this agreement through various forms of contract. These contracts, generally speaking, provided for:

(1) Use of machine tools on a rental basis.
(2) Use of "spot" tools on a rent-free basis.
(3) Jigs, fixtures, patterns, etc., on a no-cost basis (for subcontractors only).
(4) Reimbursement of extra costs arising out of subcontracting.

The manufacturers at the meeting pledged themselves to make every effort to increase their combined subcontracted tonnage by 8000 tons for the balance of 1943. It was revealed that the companies represented at the meeting had already done an exemplary job of lending their supervisory and engineering help and in some cases their tools and fixtures, to other companies which they had helped to start to make complete valves or valve parts. Machine tool builders who undertook the manufacture of complete steel valves found the manufacturing and machining processes much more difficult than they had anticipated.

As the year 1943 drew to a close, all major war programs were being serviced by the Industry. Subcontracting of valves and valve parts relieved the acute shortage at a very critical period and aided substantially in supplying overall needs.

Production Scheduling Under General Scheduling Order M-293 as an Orderly Means of Producing Valves for Important Programs

Valve and fittings manufacturers had been required to ship their products on the preference rating basis imposed by Priority Regulation No. 1. Manufacturing and shipping schedules were being constantly changed in the manufacturers' plants due to upratings and the high pressure tactics of expediters. The competition in the AA-1 band of priority ratings became so great that in December, 1942 overriding directives were issued to cover requirements for a designated group, fifty-six in number, of high octane and rubber projects. The impact of these directives which gave precedence to all orders on the manufacturers' books for the 56 projects, many of which were not identified as to end use, was so great that it resulted in a net loss of an estimated 10 to 15% in the overall production for several months of steel valves alone. The effect of these directives was helpful to the projects concerned; however, when other rubber and high octane projects as well as Army, Navy, Maritime and other important programs suffered, it was soon apparent that the overriding directive en masse was not an orderly procedure and an expensive way in production loss to obtain results. The manufacturer was at the mercy of the contractor who could place orders late with the knowledge that the late orders of necessity would have to be given precedence. Since many phases of the processes involved in the high-octane program were new, the engineering development resulted in great volumes of late orders.

Early in 1943, the Petroleum Administration requested the War Production Board to rerate all projects in its 1943 program to AA-1. Many of the projects were at that time rated AA-2X and lower. As an alternative to blanket upratings, the Operations Vice Chairman directed the adoption of production scheduling for critical common components of which steel valves was considered one of the most critical.

In April, 1943 the Shipbuilding Division proceeded to schedule steel valves for the high octane, synthetic rubber and the destroyer escort programs on the basis of giving precedence to these programs but without interference to other important programs also necessary to the prosecution of the war. In effect, this meant that only when there was conflict between valves for high octane, rubber and destroyer escorts and valves for other programs were the valves for these three programs given precedence. If conflict developed on required delivery dates between the three programs and other urgent programs which could not be resolved in the field with representatives of the Claimant Agencies, it was referred to Washington for resolution. The manufacturer's schedule was thus changed from a straight priority rating basis of operation to one of relative urgencies and realistic required dates. The question of determining when valves were needed proved troublesome in the beginning due to lack of identification of orders as to end use and when it became the responsibility of the Claimant Agency instead of the contractor to establish the required dates, this situation was somewhat improved. Also the

responsibility of the Claimant Agencies to determine when valves were needed helped to remove the pressure of expediting by the contractor. It was found that in developing schedules on a required date basis, that valves had been ordered by contractors for delivery far in advance of their actual needs and many had been delivered which were not needed, according to construction schedules, for several months. The delays in construction due to shortages of other components and manpower shortages then developing also at the sites of plants being erected tended to extend the need of valves well beyond their original required dates. Scheduling, which started with recognition to only the three accentuated programs, has since been extended to cover the requirements for all Claimant Agencies.

Delegations of Authority to schedule selected critical plants were originally issued to representatives of the Shipbuilding Division and later the Regional Offices of WPB took over the scheduling operations at the plants under the supervision of Washington. Delegations of Authority have been issued to schedule 37 plants of which 29 were operating under frozen schedules at the end of 1943. The remaining eight plants were able to meet the requirements of the Claimant Agencies on a priority basis and it was not necessary to schedule these plants.

Putting Surplus Valves to Work Through Redistribution Program-Steel Valves

Early in the second quarter of 1943, it became apparent a shortage of steel valves would become very acute starting with the third quarter of the year. In addition to efforts being made to place more and more subcontracting facilities to work on valves and valve parts, it was decided by the Shipbuilding Division that an attempt should be made to augment the increased production of the valve manufacturers by putting to needed use every existing valve, either privately or government-owned, for which the owner had no immediate use. It was estimated at that time that there were upwards of 100,000 new steel valves available in the hands of owners who could either dispense with the valves for a limited period of time or sell them outright without replacement.

In May, 1943, the Redistribution Division of WPB, after making an investigation as to the value of such a program and with the cooperation of Metals Reserve Company, proceeded to put through a program to round up all surplus new steel valves. After due consultation, Metals Reserve Company, the Shipbuilding Division and principal Claimant Agencies effected a simplified procedure whereby the flow of surplus valves into war uses would be facilitated and expedited and any incidental expenses would be absorbed by the Government. The reporting forms were mailed on July 1, 1943, to approximately 9,000 possible holders of idle new steel valves. The reporting procedure required the valve owner to report only new steel valves and in addition to giving the quantity and descriptive details, he was to indicate whether or not the valves in his possession, if sold, had to be replaced and if so, when replacement would have to be made.

The movement of steel valves resulting from this program was as follows:

Total valves reported	108,000	
Replacement required	28,000	
Balance available		80,000
Moved by February 1, 1944		
Claimants	11,500	
Manufacturers	13,000	
Holders	25,500	50,000
Moved after February 1, 1944		12,000
Available June 1, 1944		* 18,000

*11,000 Navy specification valves

The net result of this program was that it alleviated bottlenecks by placing into immediate use valves, the lack of which might have unduly delayed completion of war projects and it also released for other urgent needs the manpower and materials tied up in these surplus new valves which could then be utilized in the manufacture of other needed new valves.

Brass and Bronze Valves

The backlog of orders placed on brass and bronze valve manufacturers reached its peak in October, 1943. At the request of the Shipbuilding Division in September, 1943, the Redistribution Division arranged with Metals Reserve Company to undertake a program very similar to that conducted on steel valves. In October, 1943, necessary forms and legal procedures for the transfer of valves were completed. At the time this program was recommended, it was contemplated that it would assist in meeting the requirements of the various Claimant Agencies, ease the manpower shortage and also help meet the growing demand for essential civilian requirements which are usually greatest during the Winter season. However, in December, heavy requirements for the accelerated landing craft program were superimposed on the Industry and the surplus brass and bronze valve program was of great assistance in locating valves which were utilized in landing craft.

Approximately 9,000 questionnaires were mailed by the end of 1943 to prospective holders of surplus new brass valves.

The movement of new brass valves resulting from this program was

as follows:

Total Surplus reported through April 25, 1944		548,000
Valves moved prior to April 25, 1944		
By manufacturers	131,000	
By holders	46,000	177,000
Valves moved April 25 to July 1, 1944		*205,000
Balance listed as of July 1, 1944		166,000

*157,000 were Navy specification valves withdrawn from surplus category.

Another Chapter is Added to the Record of Results of American Industrial Production

Although the production of steel valves has been emphasized and properly so in this report, the production of other valves and pipe fittings passed through the same critical stages and presented the same perplexing problems, but to a lesser degree than steel valves. The changeover from a so-called shelf-goods industry in peacetime to a "ship-from-assembly-line" industry in wartime was a feat in itself, but the increase in production from the defense period of 1940 to the wartime of 1943 was one of the production miracles of the war, as evidenced by the following selected and significant statistics.

Description	Production Increase (1943 to 1940)
Steel Turbine Valves	Almost 5 times
All Other Steel Valves	Over 5 times
Compressed Gas Cylinder Valves	Almost 4 times
Brass and Bronze Valves	Over 2 times
Iron Body Valves	Almost 2 times
Steel Pipe Fittings	Almost 3 times

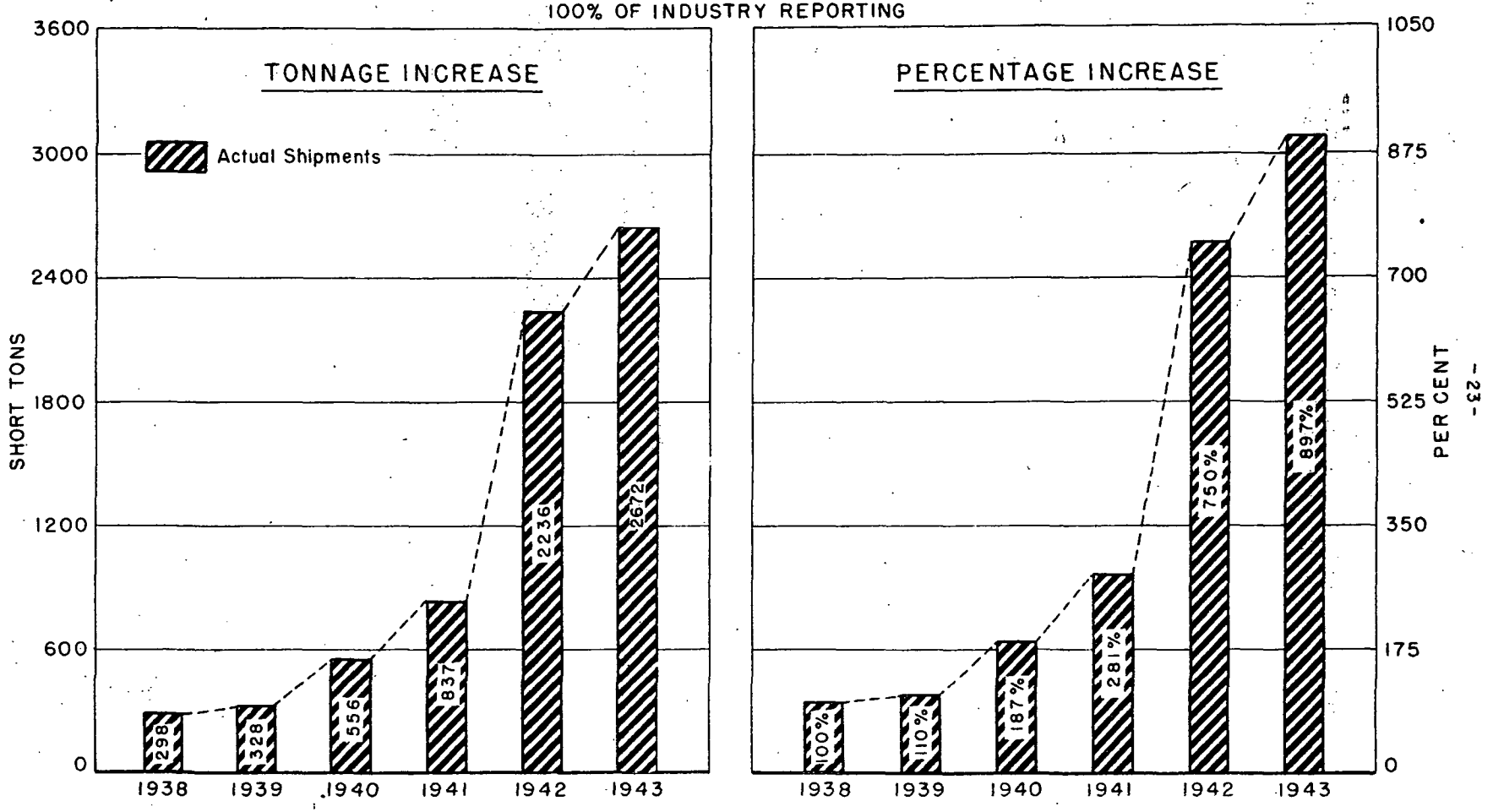
The following charts show the increases in shipments in the first five categories from 1938 through 1943.

STEEL TURBINE VALVES

INCREASE IN SHIPMENTS FOR SIX YEAR PERIOD 1938-1943 INCLUSIVE

BASE PERIOD 1938 = 100%

100% OF INDUSTRY REPORTING



Analysis Unit, Valve and Fittings Section,
Shipbuilding Division, War Production Board.

February 1, 1943
452003-3036

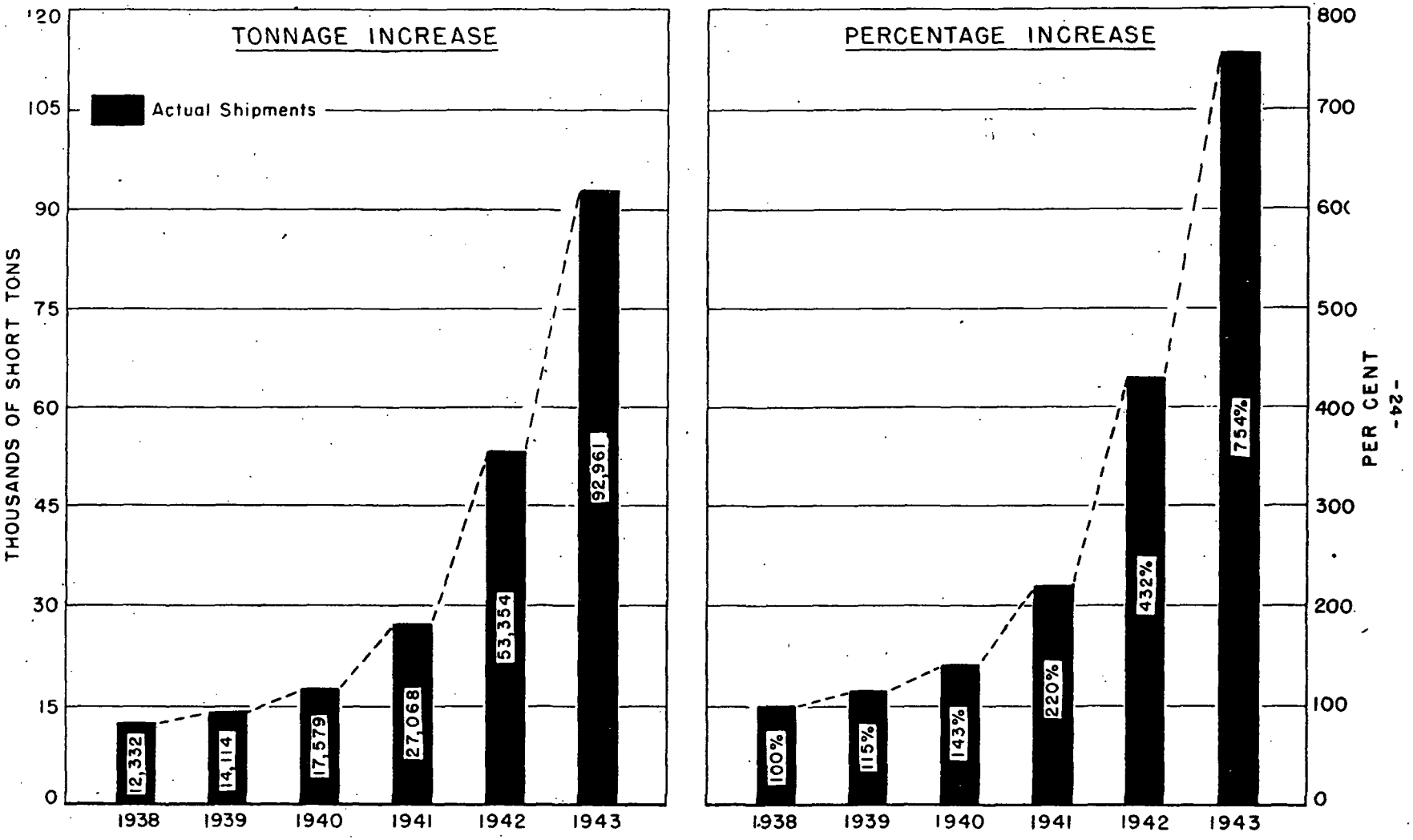
STEEL VALVES

(Not Including Safety, Relief or Turbine Valves)

INCREASE IN SHIPMENTS FOR SIX YEAR PERIOD 1938-1943 INCLUSIVE

BASE PERIOD 1938 = 100%

95% OF INDUSTRY REPORTING



Analysis Unit, Valve & Fittings Section
Shipbuilding Division, War Production Board

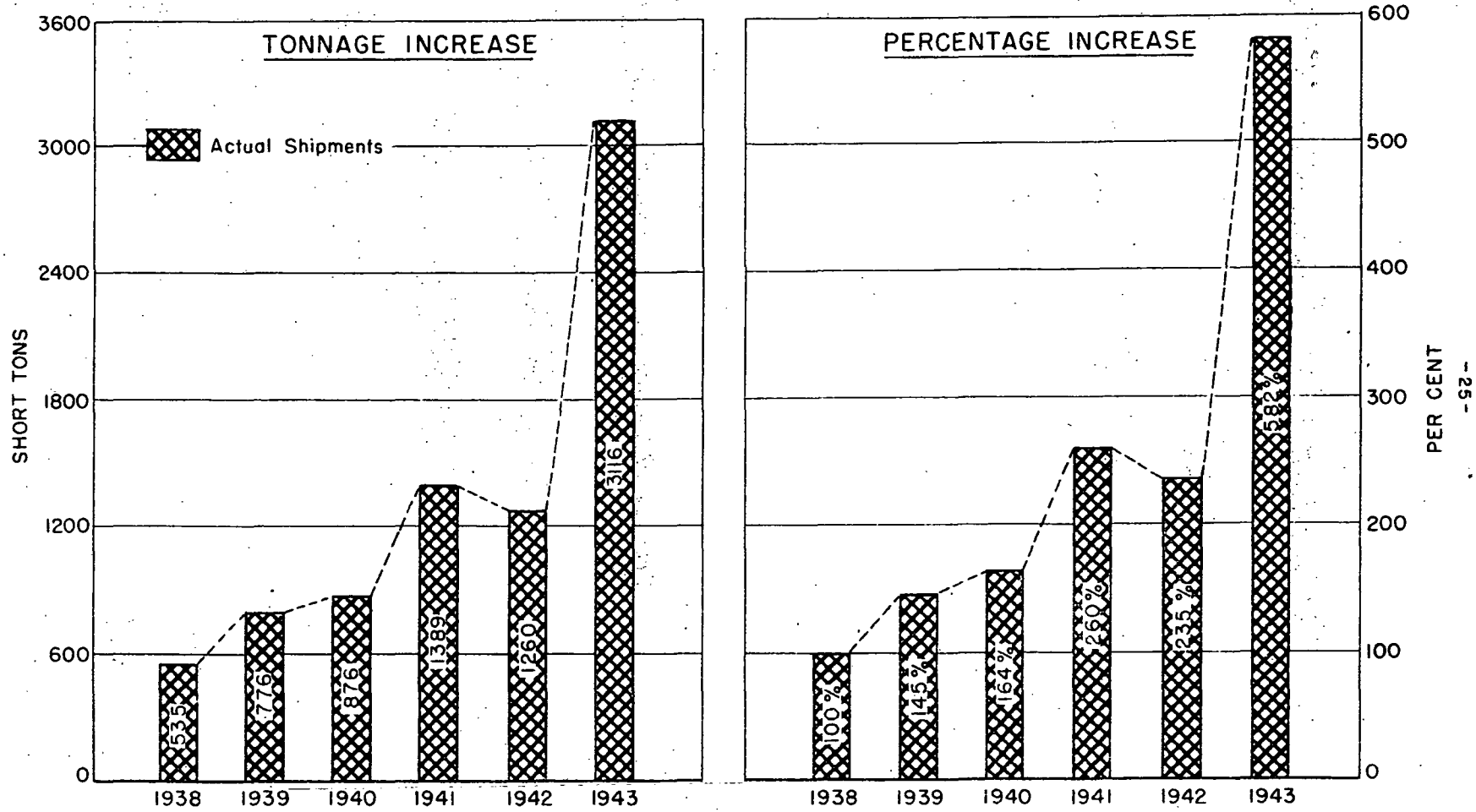
February 1, 1944
452003-1054

COMPRESSED GAS CYLINDER VALVES

INCREASE IN SHIPMENTS FOR SIX YEAR PERIOD 1938-1943 INCLUSIVE

BASE PERIOD 1938 = 100%

1938-42 inc. 82% OF INDUSTRY REPORTING
1943 99% OF INDUSTRY REPORTING



Analysis Unit, Valve & Fittings Section
Shipbuilding Division, War Production Board

February 1, 1943
452003-2021

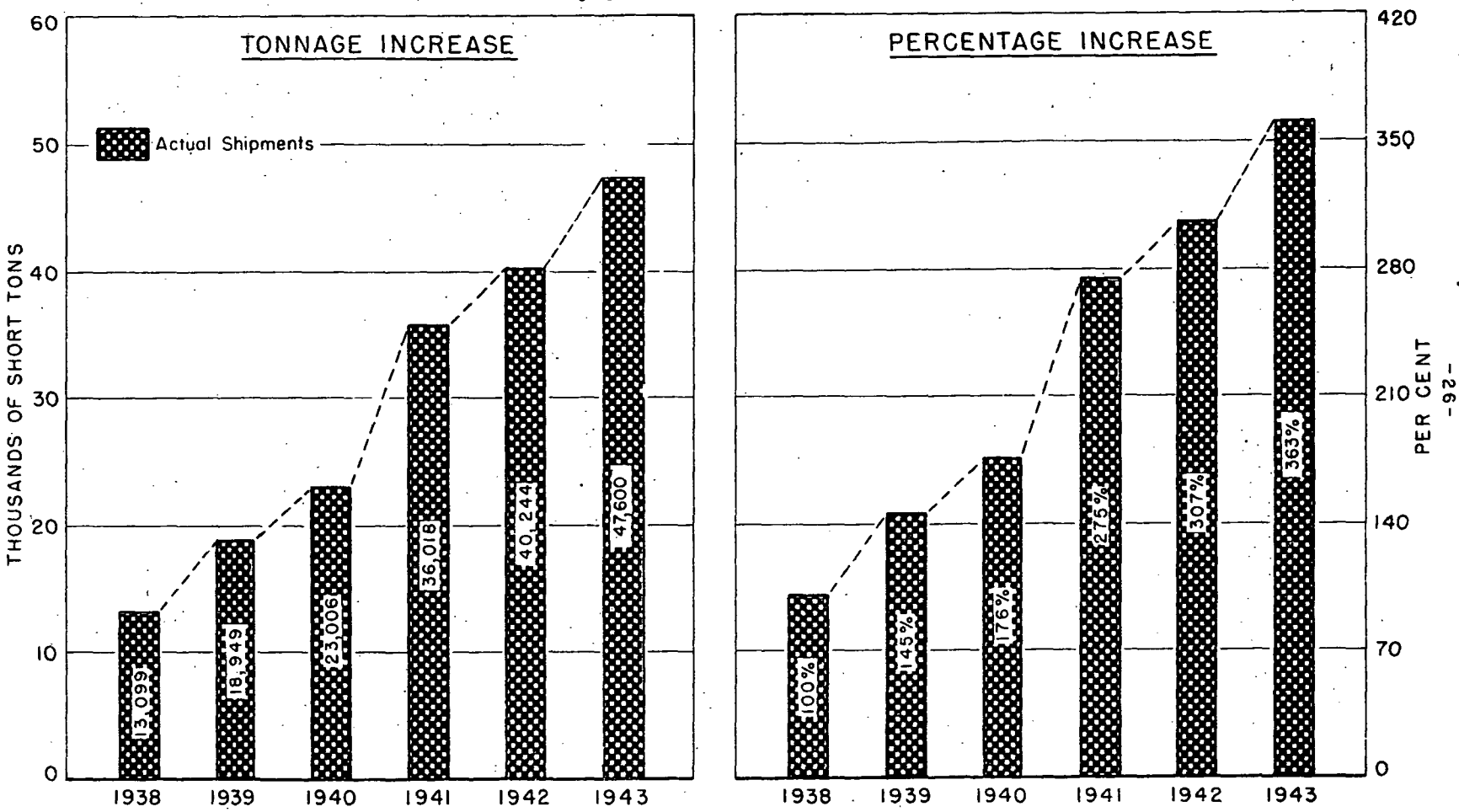
BRASS OR BRONZE VALVES

(Not Including Safety, Relief or Compressed Gas Cylinder Valves)

INCREASE IN SHIPMENTS FOR SIX YEAR PERIOD 1938-1943 INCLUSIVE

BASE PERIOD 1938 = 100%

74% OF INDUSTRY REPORTING



Analysis Unit, Valve & Fittings Section
Shipbuilding Division, War Production Board

February 1, 1943
452003-1051

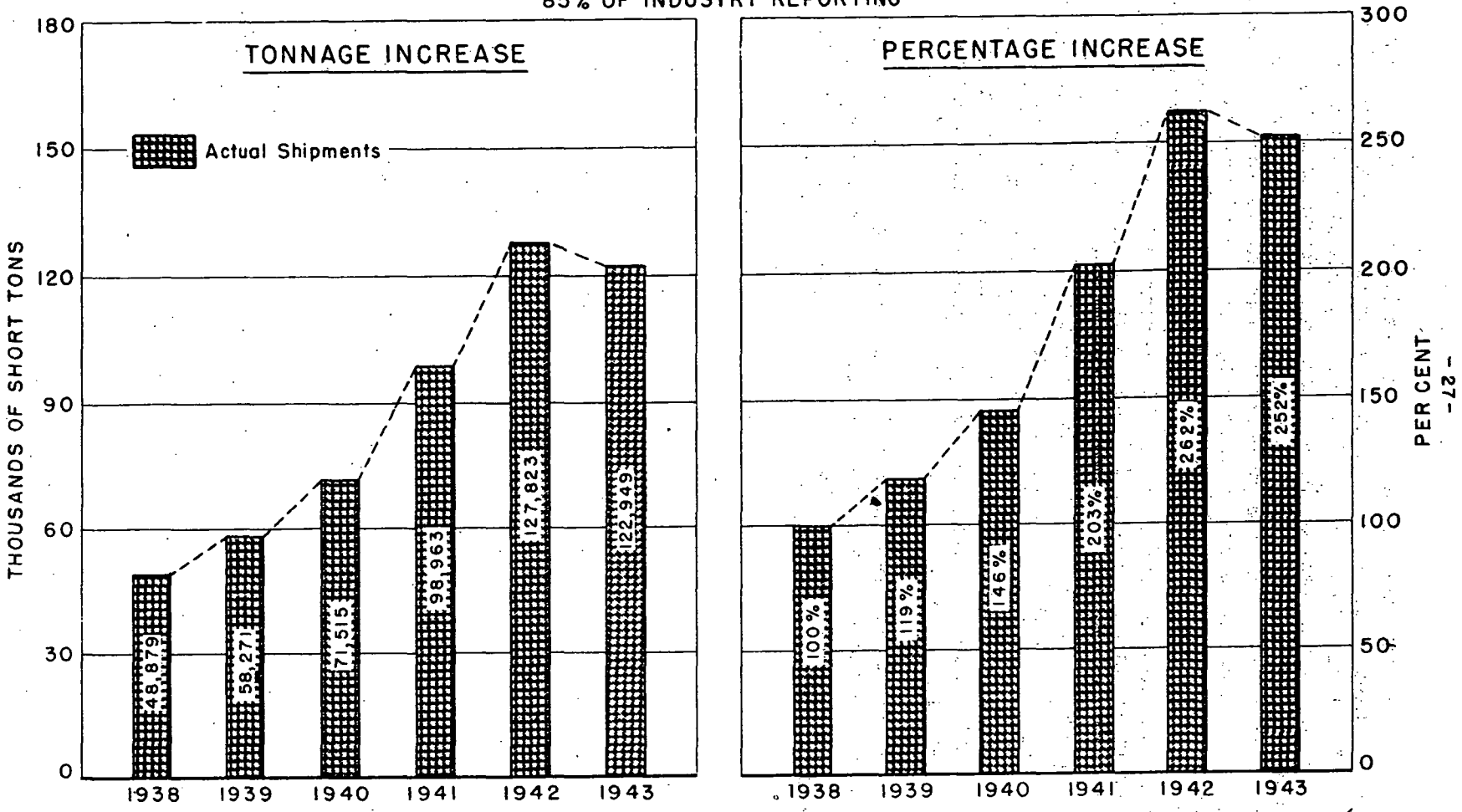
IRON BODY VALVES

(Not Including Safety and Relief Valves)

INCREASE IN SHIPMENTS FOR SIX YEAR PERIOD 1938-1943 INCLUSIVE

BASE PERIOD 1938 = 100%

85% OF INDUSTRY REPORTING



Analysis Unit, Valve and Fittings Section,
Shipbuilding Division, War Production Board.

February 1, 1943

452003-3037

The backlogs of the Industry, which ran in 1943 from six (6) to nine (9) months full production at current production rates for steel valves had as of July 1, 1944 dropped to four (4) months production. The backlog in brass and bronze valves in 1943 and thus far in 1944 has remained about the same--approximately five months production. Manpower shortage in certain areas held down the production rate in 1943 but fortunately the crisis in valves in general was over by the end of the year. Landing craft valves however continued to require special scheduling treatment but all requirements were fully met. The general peak of demand for valves and fittings has passed according to all present indications although shortages of certain kinds of valves and fittings may crop up from time to time. It is not possible as long as material and manpower shortages exist, to meet promptly every demand for more than 100,000 different items produced by the Industry, but essential and critical requirements are being met while the backlog of orders for the war effort is being reduced. It is expected that large surpluses of steel and brass valves will be reported by the procurement agencies due to changes in war programs, cutbacks, over-ordering, etc. when inventories are compiled.

The productive capacity of the Industry is now adequate to take care of all essential needs for the duration. These needs will be satisfied with the continued close cooperation of manufacturers, users and government agencies.