

Statement By

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Before The
ARMY INDUSTRIAL COLLEGE
Washington, D. C

Course 1938-1939

"THE SHIPBUILDING INDUSTRY"

Oct. 21, 1938.

I am pleased to again appear before the Army Industrial College and talk to you gentlemen on the subject of "The Shipbuilding Industry". As this is my third appearance before the College I must necessarily repeat many of the statements made in previous talks.

The shipbuilding industry has two principal sources of demand for ships:

- 1. The United States Government
 - 2. Commercial shipping interests
1. Private shipyards build for the Navy, the Maritime Commission, the Coast Guard, the Lighthouse Service, the War Department and other departments of the Government.

For the Navy they share about equally with government navy yards in the building of naval vessels. Private yards repair vessels for all branches of the government except the Navy Department.

2. For commercial use, shipbuilding may be divided broadly into

- (a) Vessels for international trade, and
- (b) Vessels for domestic trade.

Vessels for the former are mostly of the seagoing type - that is, of sufficient size and power to operate successfully to any port of the world. Vessels for domestic trade are of many groups:

- (a) Those engaged in the intercoastal trade which are largely of sizes and types approximating those in foreign trade,
- (b) Those for coastwise trade only which are of the smaller sizes suitable for the shorter distances they travel between ports,
- (c) Auxiliaries to supplement both international and domestic carriers;
- (d) Vessels of various types for Great Lakes service,
- (e) Vessels of various types for river service,
- (f) Small craft of various types such as tugs, carfloats, barges, ferryboats, fireboats, trawlers, and miscellaneous types.

The shiprepairing branch of the industry, whether in coastal waters, on the Great Lakes or on the Great Rivers repair vessels of all types for domestic service.

While I assume that this group is interested in the shipbuilding industry as a whole, I believe you are more deeply interested in the facilities that exist for the construction of vessels of the larger type and in being shown some evidence of the demand upon the industry

for the construction of both government and commercial vessels

An understanding of this subject requires some knowledge of the volume of work performed for the government by the private shipyards, together with a knowledge of the size of our seagoing merchant fleet as it now exists and as it may expand in the future.

So far as construction for the government is concerned, suffice it to say for the moment that the volume of such work now on hand in the private shipyards approximates one hundred and ninety million dollars, with other contracts pending.

So far as merchant tonnage is concerned, I have attached Exhibit "A" which shows the total tonnage of seagoing vessels owned by the principal maritime nations of the world at the end of 1936, together with the gross tonnage built by each of these nations by five-year periods beginning with January 1, 1922. This exhibit is the same as presented to you last year but it clearly shows the extent to which the United States has lagged in the past fifteen years not only in failing to build a percentage of new shipping each year so far as its own shipping is concerned, but also a failure to keep pace with what other maritime nations have done during the same period.

I shall first analyze some outstanding disclosures in Exhibit "A", but will have the pleasure later in my remarks to show you some important events since the end of 1936 that will tend to rectify the unfortunate conditions as to ship replacement that have existed during the past fifteen years.

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The tonnage shown in Exhibit "A" is divided into ships of the combination passenger and cargo type, cargo ships and oil tankers. Vessels in both the foreign and domestic trades are included, although Great Lakes and special type vessels are excluded. The United States tonnage in the table includes about 1,000,000 gross tons of idle tonnage owned by the Maritime Commission although 75 vessels of this lot aggregating in excess of 600,000 gross tons were sold by the Maritime Commission in 1937 for scrapping.

Of the tonnage shown for the United States, fully one-half is in domestic trade, whereas the tonnage given for other nations is practically all in foreign trade.

Age of United States Vessels

On the basis of an average effective life of a ship which is recognized to be twenty years, the table shows that 87.3 percent of the United States tonnage is over fifteen years old. As a matter of fact approximately the same percentage of tonnage is eighteen years old, or more as it was wartime built. Other nations have a very much smaller percentage of old tonnage.

Still more striking is the fact that 97.3 percent of the cargo ship tonnage is over fifteen years old at the end of 1936, while the tanker tonnage of this age at that time is 84.2 percent. The only United States tonnage that approximates the degree of modernity of that of other nations is the combination passenger and cargo ship group, of which 31 vessels were constructed under the provisions of the Merchant Marine Act of 1928. The United States is, therefore, still competing in foreign trade with

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wartime built vessels as compared to a large percentage of modern and much more efficient tonnage of other nations.

Speed of United States Vessels

It is also a fact that the average speed of United States merchant vessels in international trade is less than that of the vessels of other maritime nations. Of the six countries listed on Exhibit "A", we find that the United States ranks second in the volume of tonnage, fifth in the speed of its tonnage and sixth, or at the bottom of the list, as far as age is concerned.

New Construction

The last report of Lloyd's Register of Shipping, as of September 30, 1938, shows 2,712,277 gross tons of world shipbuilding under construction. This is approximately 190,000 tons less than at the same date a year ago. But while world tonnage under construction has shrunk during that period construction in the United States has shown a slight total increase. The construction by nine leading maritime nations as of September 30, 1938 is as follows:

Great Britain	885,481
Germany	382,791
Japan	319,862
UNITED STATES	250,909
Holland	246,892
Italy	153,485
Sweden	116,950
Denmark	111,690
France	78,425

This report shows that the United States stands number four in the building of merchant tonnage at that date with 9 percent of world tonnage under construction. During the five year period from 1932 to 1936 inclusive, United States construction, however,

averaged but 3.6 percent of world construction. These figures, however, are apt to be very misleading unless thoroughly understood. Lloyd's reports cover all vessels above 100 gross tons each that have actually been begun during the period under consideration, so that while the 251,000 tons of shipping building in the United States covers seagoing vessels it also covers a large number of small craft above 100 gross tons each, the exact tonnage of which is not available at the present time.

Up to the end of 1937 the replacement program of cargo vessels was in a deplorable condition, as presented by the United States Maritime Commission in its "Economic Survey of the American Merchant Marine" dated November 10, of that year. During this year, however, contracts have been placed by the Maritime Commission for 20 cargo vessels for international trade and 4 by private interests and bids are now pending for several more, while good progress is being made on the construction of the largest combination passenger and cargo vessel ever constructed in the United States, which is expected to enter the Trans-Atlantic trade in 1940. These new vessels now under construction are a first step in improving the unsatisfactory replacement condition set forth in the Maritime Commission's survey of last year.

Shipping In Domestic Trade

While our shipping in domestic trade is also nearly obsolescent, its replacement is, however, a domestic problem not subject to the complications involved in connection with American shipping in the foreign trade where competition with

foreign nations is concerned.

Percentage of American Goods Carried In United States Vessels

The Merchant Marine Acts of 1920 and 1928 aimed to carry fifty percent or more of our goods in foreign trade in American vessels. The Merchant Marine Act of 1936, in its preamble asks that "**** a substantial portion of such trade be carried in American ships". This trade can be measured either by its value or its volume. The following figures are interesting as to the percentages of American commodities in foreign trade carried in American and foreign vessels in 1929 and the average percentage from 1930 to 1935 and in volume for the year 1936, inclusive:

	<u>Volume In Tons</u>			.	<u>Value</u>	
	<u>1929</u>	<u>Average 1930-35</u>	<u>1936</u>		<u>1929</u>	<u>Average 1930-35</u>
American	39.8	35.6	34.0	:	33.1	35.3
Foreign	<u>60.2</u>	<u>64.4</u>	<u>66.0</u>	:	<u>66.9</u>	<u>64.7</u>
	100.0	100.0	100.0	:	100.0	100.0

The participation of the United States in world foreign trade has averaged for several years about 11 to 14 percent of such trade, whereas the tonnage of American shipping in such trade has been only from 5 to 7 percent of world tonnage. The United States would be justified, therefore, on a basis of pro rata participation to carry in its own vessels twice the amount of its own exports and imports than it now transports.

With this brief statement of the position of the United States in World Shipping I will confine my further remarks to the subject of Shipbuilding.

SHIPBUILDING

Shipbuilding, as a general term, includes both shipouilding and shiprepairing and the two industries should be considered together, and in close relation to allied marine industries. In their national aspect the industry should be viewed from at least three angles:

1. As a factor in national defense through its importance to the country in the construction of government vessels either in a time of peace or in a time of national emergency.
2. As an economic factor in the construction of ships for the carriage of persons and commodities in both our domestic and our foreign trade.
3. As an important industry giving
 - (1) Employment to a large number of people in the construction of ships themselves, and
 - (2) Employment to those engaged in the fabrication of the materials and equipment that go into ships.

General

It is important to an understanding of shipbuilding organizations to constantly bear in mind that a ship is a highly specialized product, and that the method of construction bears little relation to the construction of quantity or mass production items such as automobiles, agricultural machinery, sewing machines, typewriters, etc., wherein the essential features are a constant and uninterrupted flow of work, the use of labor saving tools and equipment specially designed for specific operations.

There are more automobiles of the same type produced in one day in some of our large automobile plants than there are seagoing ships produced in the United States in twenty years. Large expenditures for special machinery in the production of repeat parts in the automobile industry are justified, whereas, such expenditures for the production of the few like parts that go into the production of one or two ships would be wholly out of the question. The price of an automobile with all parts of it special and different from a standard make would be many times that of a standard design produced in large quantities.

As A National Defense Factor

A ship, therefore, is in the category of a made-to-order product and requires in its construction a staff of highly trained technical employees, and a nucleus of highly skilled all around mechanics familiar with ship construction. The technical staff requires years of training, and must be made up of those who have kept abreast of the development of the art and science of shipbuilding, not only in the United States but in foreign countries. The continuance of such a technical staff in the design and building of ships at all times is essential to the maintenance of an efficient shipbuilding organization and requires the continuous building of ships if a shipyard is to be available for use in a time of national emergency.

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As An Economic Factor

In its position as an economic factor, it is equally important that there should be a sufficient volume of shipbuilding at all times to maintain an efficient scientific and mechanical staff in order that the ships for trade are the most up-to-date and comparable as to suitability for the service intended with the latest designs of competing nations.

As An Industry

As an industry, shipbuilding probably gives a more diversified character of employment to labor than any other known business. The shipyard itself regularly employs 25 or more trades, and others at intervals, whereas the materials and equipment it buys spread employment directly or indirectly to almost every known industry throughout the entire United States. Approximately one-half the cost of a ship is expended within the shipyard and the remainder for materials and equipment, taxes, insurance and other outside items.

Owing to its highly specialized character, the percentage of skilled mechanics in a shipyard is much higher than in most industries, and the average labor rate in the industry, as reported by the Bureau of Labor Statistics, Department of Labor, is at or near the highest prevailing in the durable goods industries. On the basis of an average labor rate of 80 cents an hour, which is a little less than recently reported by the Department of Labor, and assuming the same rate for labor in allied industries, a ship costing \$2,000,000 would give employment to about 1000 men for one year, as 80 percent of the entire cost goes to labor when taking into

account the production of materials and equipment as well as the assembly of the ship itself.

Shipbuilding Facilities

I assume that this group is interested in the facilities that exist in the United States for the building and repair of both Government and commercial vessels. A survey by the National Council of American Shipbuilders made about two years ago discloses that there were then existent in operating coastal shipyards the following building ways of capacity to construct seagoing vessels:

- 9 Ways for the building of vessels from 200 to 300 feet
- 7 Ways for the building of vessels from 300 to 400 feet
- 23 Ways for the building of vessels from 400 to 500 feet
- 39 Ways for the building of vessels of 500 feet and over

A total of 69 building ways for vessels of 300 feet or more in length. There has been little change since this survey.

In addition to building ways immediately available in coastal shipyards there are others that can be put in condition at a moderate expense, sufficient in number to bring the total number of available ways to 100. This figure corresponds very closely with the estimate made by the Maritime Commission in its survey of November 10, 1937.

Machinery and construction equipment is either ample for the construction of ships on the building ways available or could be quickly obtained.

Shipbuilding On The Great Lakes

In addition there are on the Great Lakes 11 building ways that can build vessels of the maximum length required for Lake service. The maximum size of vessel that can pass through the locks from the Great Lakes into the St. Lawrence River is 260 feet long, 43 feet beam and 14 feet draft, or about 3,800 tons gross. The St. Lawrence

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Waterway, under consideration for the past few years would admit 87 percent of world tonnage to the Great Lakes.

Shipbuilding On The Great Rivers

The Great Rivers have ample facilities for building the types of vessels that can navigate those waters. Upon the completion of the present program of dredging and dams on the Great Rivers there will be about 13,000 miles of navigable waters with channels of varying depths. The amount of tonnage built on the Great Rivers is extensive. The rivers are feeders to the sea, but river yards have not been building many vessels that are classed as of the seagoing type, except a few Government vessels that may be built on the Rivers for salt water service.

Present Facilities Ample

Since the completion of the World War program the greater part of all commercial shipbuilding has been performed on the Atlantic Seaboard, from Maine to Virginia inclusive. Building on the Pacific Coast has been small in amount, and in recent years there has been very little building on the Great Lakes. The Shipping Act of 1936 provides for a differential in cost to encourage shipbuilding on the Pacific Coast.

About forty-five of the available building ways in private shipyards are occupied at present by naval vessels, combination passenger and cargo vessels, cargo vessels, oil tankers or small craft. Such occupancy is not of serious consequence in connection with a long range building program, however, as the length of time on the building ways can be materially shortened if necessary to

provide facilities for laying down other vessels. Most merchant ships can be easily launched in periods ranging from six months to one year, and most naval vessels with the exception of battleships, airplane carriers and cruisers can be launched within one year. During the World War, the average way occupancy of destroyers in a yard where a large number of them were built was about six months. The time on the building way can be controlled materially by the program of construction adopted. The developing of an efficient personnel is a more difficult problem than the provision of materiel.

Notwithstanding the large naval building program and the considerable number of merchant vessels now under contract, there does not appear to be any immediate necessity for an increase in shipbuilding facilities over and above those now existing, or that can be made readily available. Whenever there is a considerable spurt in shipbuilding, projects for new shipyards appear. Their addition to existing facilities is of doubtful value unless such shipyards can be developed on the basis of permanency, with adequate capital and with the prospect of a continuation of a volume of business that will make them justifiable.

Great Britain has had an experience over many years in dealing with excess shipyard facilities and through the National Shipbuilders Security Limited, a corporation organized some ten years ago, has consistently reduced the total shipyard capacity to make it more nearly suitable for the demands upon the industry. Approximately one-third of the facilities that existed ten years ago have been dispensed with through the activities of this corporation.

Small Shipyards

Aside from shipyards capable of building seagoing vessels there are a large number of shipbuilding plants in the United States capable of building vessels of small size, such as tugs, barges, carfloats and other small craft. About 250 were so recorded at the time the industry was working under a code from 1933 to 1935. They represent, however, a small percentage of the total employment in the industry.

Ship Repair Facilities

As stated, there are at the present time ample ship repair facilities on the seaboard, on the Great Lakes, and on the Great Rivers, for the repair of vessels of all types that enter our harbors. These facilities are well distributed over the Atlantic Seaboard, the Gulf, the Pacific Coast, the Great Lakes, and the Great Rivers.

Records of the American Bureau of Shipping show available graving docks, floating docks and marine railways as follows:

On the North Atlantic	166
South Atlantic	63
Gulf Coast	31
Pacific Coast	<u>58</u>
Total:	318

Of the above, 160 will handle vessels up to 200 feet in length,

An additional 74 vessels up to 300 feet,
An additional 29 vessels up to 400 feet,
An additional 32 vessels up to 500 feet,
And 23 are able to accommodate ships of 500 feet in length and over.

Total: 318

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Allied Industries

With a very few exceptions there are ample facilities in the United States for the production of the materials and equipment required in shipbuilding and shiprepairing. As most allied industries devote but a small part of their production to shipbuilding and shiprepairing there is usually an ample margin to take care of any ordinary increase in volume of shipbuilding, either of commercial or government work. Restrictive legislation, however, concerning employment and limitation of profits have eliminated from the field a considerable number of those industries that have in the past bid on government work. More specification and inspection requirements on government work from year to year tend to delay deliveries of materials and equipment and lengthen the time of construction of government vessels. The few exceptions to which I refer are new material requirements brought about by the development of the art and science of the industry.

The broad participation geographically and by industries of the Allied Industries in furnishing materials and equipment used in shipbuilding is shown on Exhibit "B" attached. As shown on this Exhibit, approximately fifty percent of the cost of a vessel is for the materials entering into or used in its construction.

Exhibit "C" shows the many different kinds of material used in shipbuilding and the States from which these materials originated in the construction of a large size commercial vessel built a few years ago.

Employment

By virtue of the large volume of naval construction during the past few years, the considerable number of oil tankers under construction during the past two years, and a large number of small craft such as barges, ferryboats, tugboats, etc., under construction, employment in the industry, even before the new work involved on cargo vessels now underway, had reached the point where it was in excess of employment in the industry at any time except during the World War program. Any real measure of employment in the industry must take into account employment in government navy yards as well as in the private shipyards because the navy yards utilize the same kinds of labor that are employed in the private shipyards. No accurate figures are available to show the total labor employment in shipbuilding and shiprepairing taking into account private yards of all sizes, and navy yards, but I made a statement here last year that there were probably 80,000 men employed in private shipbuilding and shiprepair yards and government navy yards combined, and probably an equal number in the allied industries making material and equipment for the building and repair of ships.

Some trades are now utilizing the available supply of men familiar with shipbuilding so that the industry is faced with a problem which always occurs when shipbuilding is very active and that is the development of men for shipbuilding work that are at other times employed in other lines of business.

Shipyard Organization

It is hardly necessary to tell this group that a shipyard must be located where there are water facilities ample for launching and for wet docking vessels while being outfitted prior to delivery. It must have shops suitably equipped for each of the trades involved, necessarily covering a considerable amount of ground and requiring facilities for the assembly, storage and transportation of materials.

Technical Staff: I have previously mentioned the technical staff of a shipyard. Every important shipyard must carry a staff of technical men who have devoted their lives to the design of vessels and its machinery, and many of these technicians have been continually employed in such work for twenty, thirty or even forty years.

Bids for new vessels are submitted on general plans and specifications supplied by the buyer whether for a Government or for a commercial vessel. The responsibility then rests with the builder, or in some cases, upon a naval architect employed by the owner to prepare the complete detailed plans involved in the construction of the vessel. Government vessels involve the preparation of more plans than commercial vessels, but the number in each case is great. It is reported that on an airplane carrier the number of plans is as high as 2,000 and on a cruiser from 1400 to 1500, with cost in the first case mounting as high as \$2,000,000 or more, and in the case of the cruiser to \$700,000 or more. Shipyard estimates of the cost of plans for battleships now under construction were all in excess of \$2,000,000.

Naturally if more than one ship is built from the same plans the cost of plans per ship is less. As a matter of fact, however, the number of ships built from duplicate plans in peacetime is always very small.

A factor of great importance in shipbuilding and ever present in the minds of the designer is the question of weight. Ships are designed for specified drafts and in consequence the permissible weight of a ship is limited, and all factors of design affecting weight have to be given consideration.

Mechanical Staff: As previously stated, there are not less than 25 trades regularly employed in a shipyard. Those men who lay down the lines of the ship, prepare the templates and make patterns must have considerable technical ability as well as mechanical ability, and furthermore, all departments must have and must retain a nucleus of men skilled in ship construction, who are able to read plans. Shipbuilding is so diversified and so special in character that it requires a larger percentage of men with greater all around experience than prevails in most industries. It is possible to develop men for some of the work in all trades in a comparatively short time if a nucleus of experienced shipbuilders is maintained and helpers and laborers can, of course, be drawn from other industries and perform satisfactory work within a very short time.

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The Cost Of Ships

The cost of ships, like that of practically all commodities, has gone up within the past few years, and this has been due to reasons beyond the control of the shipbuilder. Constantly increasing labor rates, higher material costs, which are again due to higher labor rates, social security taxes, additional requirements of specifications and more rigid inspection have all led to higher costs.

The Maritime Commission in its "Economic Survey of the American Merchant Marine" states that not less than fifty bureaus and executive departments and independent agencies exercise some measure of jurisdiction over shipping. While this number may be a little high for shipbuilding, it is nevertheless true that a great number of executive departments do have something to say in connection with shipbuilding. The time involved in dealing with the various departments and securing their approval of those matters over which they have jurisdiction is a factor of heavy expense when building for the government, and to a lesser degree for private account,

A few figures to show the average labor rate in the industry by six month periods from June 1933 to June 1938, as reported by the Bureau of Labor Statistics, Department of Labor, should be convincing as to a substantial reason for higher costs today than prevailed five years ago. They are as follows:

June 1933	\$0.555
Dec. 1933	.651
June 1934	.722
Dec. 1934	.756
June 1935	.742
Dec. 1935	.774

June 1936	\$0.754
Dec. 1936	.794
June 1937	.803
Dec. 1937	.850
June 1938	.833

New Developments In Shipbuilding

The most outstanding development in the shipbuilding industry during the past ten years is welding. Whereas ten years ago a welded barge was considered as an experiment, it is now the general rule to weld barges, carfloats and a large percentage of other small craft, and the art has been extended both in commercial and government shipbuilding to the almost complete welding of the internal structures of ships and to a large percentage of shell plating, the most advanced step being the construction of four tankers 521 feet long, 70 feet beam and 40 feet depth of 18,500 tons deadweight, in which the entire tank space extending from the engine-room bulkhead to the forward end of the tank space for a length of 353 feet is to be of completely welded construction. Three of these vessels are in service and the welding, so far as known, has proven entirely satisfactory.

Welding in the place of riveting has not only changed the details of ship and machinery design but it has required the use of different types of equipment than those used with riveted construction, so that pneumatic equipment, punches and some other shipyard tools are being discarded for welding equipment. While old equipment is being retained in most shipyard shops for the present it is probable that much of it will be discarded within a few years. Welded construction during its development has been

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somewhat slower than riveted construction, but it is anticipated that this handicap will be overcome as more experience is had with welded construction.

Other more gradual developments are extended use of the Diesel engine, higher pressures and higher temperatures of steam installations and improvement in hull forms.

Private Shipyard Construction Of Government Vessels

Except at rare intervals merchant shipbuilding in the United States, by itself, has not been adequate to maintain a highly efficient shipbuilding industry. Several of the large shipbuilding plants have been developed and maintained largely through participation in the building of naval vessels. Naval shipbuilding has always been considerable in amount, even when appropriations were small, and it has been an important factor in developing and maintaining shipbuilding organizations. As stated, the naval shipbuilding program is at present divided approximately one-half to the private shipyards and one-half to the government navy yards. There are those in Congress who urge the building of all naval vessels in government navy yards. Such a policy would be disastrous to the private shipbuilding industry if that industry were to be called upon to meet a major emergency. During the World War, it is well known that the navy yards were largely engaged in the repair of their own vessels and they called upon the private shipyards not only for the building of the major part of such naval vessels as were constructed during the war period, but for large volumes of repairs to naval vessels.

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The recommendations of the Senate Committee on Munitions, of which Senator Nye was chairman, were for one hundred percent navy yard building of naval vessels. The committee has gone further by suggesting that the War Department should have dies and fixtures made in peace time and ready for use in private industry in the event of an emergency. It would not be possible to proceed far on such a recommendation. The art of shipbuilding is changing so fast that it is impossible to prepare very far ahead the equipment necessary to be used in the building of ships, particularly smaller equipment such as dies and fixtures, and other devices necessary to produce small parts in large numbers expeditiously.

The answer of the shipbuilding industry to the Munitions Committee Report is contained in a booklet prepared under the auspices of the National Council of American Shipbuilders and released in March 1937. This answer points out the important part played by shipbuilding in the affairs of this country and the importance of its preservation.

Emergency Expansion

In the event of an emergency it is important to take the greatest possible advantage of existing facilities and existing experienced shipbuilding personnel. I believe that expansion to the best advantage of the Government in an emergency could be made through an expansion of existing facilities under the same management so as to preserve technical staffs and a nucleus of mechanical staffs. Such expansion could take place either on property contiguous to existing shipyards or shiprepair yards, or, if necessary, at other locations where the labor market is good. In an emergency, an

expansion of shipbuilding personnel would be inevitable, and that could best be accomplished by the development under existing shipbuilding personnel of others who may be called into this field. New shipyards under new management, if built, must take their personnel from existing shipyards with serious handicap to the latter as occurred during the World War, and in my opinion with a production of fewer ships and at a higher cost than would have resulted if these ships had been built by the expansion of existing facilities and existing organizations.

Types Of Ships

To those concerned with the development of a shipbuilding program in an emergency, consideration should be given to a limitation of the number of types and the production in particular yards of as many vessels of the same type as the facilities of those particular yards will permit. Such a program involves less cost in production and more units in the same length of time.

Merchant Marine Act of 1936

When I addressed this body a year ago the Merchant Marine Act of 1936 was in effect. The Maritime Commission had been organized and was doing business. Since my last meeting with you the Act of 1936 has been substantially modified in various particulars, making it more flexible than the original Act. While it is believed there are still certain provisions of the Act that should be further modified, nevertheless, substantial progress has been made.

Subsidy contracts with ship operators have been changed from the provisions of the Act of 1928 to the new Act, and as stated, contracts for the building of 24 cargo vessels and one large

combination passenger and cargo vessel have been placed. Also, through cooperation with private interests, contracts for the construction of 12 large oil tankers of a type suitable for use in a national emergency are under construction through the joint efforts of the Maritime Commission, the Navy Department and private interests.

Bids are out for the construction of a considerable number of seagoing cargo vessels and seagoing combination vessels by the Maritime Commission and by private interests. The Maritime Commission have stated their program to be approximately 50 new vessels a year for some years to effect the necessary replacement of over-age vessels or those that are rapidly becoming obsolescent

It is too early to predict the ultimate working out of the Merchant Marine Act of 1936, but a substantial start has been made.

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I have made no attempt in my statement to prophesy the future of shipping under the Merchant Marine Act of 1936. The difficulties involved in the American shipping problem are well set forth in the Maritime Commission's Survey of November 10, 1937. Substantial modifications of the Act and an equitable working out of existing contracts with ship operators are necessary if the United States is to continue to have a merchant fleet in foreign trade under private operation.

There are many other interesting phases of the shipbuilding problem, but I have touched only upon those which it seems to me to be of the most interest to your class.

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TABULAR STATEMENT OF OCEAN-GOING IRON AND STEEL VESSELS OF 2,000 GROSS TONS AND OVER (EXCLUDING GREAT LAKES VESSELS AND VESSELS (#) OF SPECIAL TYPES) OWNED BY THE PRINCIPAL MARITIME NATIONS OF THE WORLD SHOWING

1. Number and Tonnage of Vessels Built During 5- year Period Ending 12/31/26
2. Number and Tonnage of Vessels Built During 5- year Period Ending 12/31/31
3. Number and Tonnage of Vessels Built During 5- year Period Ending 12/31/36
4. Number and Tonnage of Vessels Built During 15-year Period Ending 12/31/36
5. Number and Tonnage of Vessels in Entire Fleet.
6. Number and Tonnage of Vessels Built Prior to 1/1/22
7. Percentage that Tonnage of Vessels Over 15 years of Age Bears to Total Fleet Tonnage

Countries And Types	Built Between 1/1/22-12/31/26		Built Between 1/1/27-12/31/31		Built Between 1/1/32-12/31/36		Total Built 15-Year Period 1/1/22-12/31/36		Total Fleet 12/31/36		Total Vessels And Tonnage Over 15 Years Of Age		Percentage Tonnage Vessels over 15 Yrs. Bears to Total Tonnage
	No.	Gross Tons	No.	Gross Tons	No.	Gross Tons	No.	Gross Tons	No.	Gross Tons	No.	Gross Tons	
ALL TYPES													
United States	39	259,063	55	527,932	31	286,810	125	1,073,805	1444	8,461,603	1319	7,387,798	87.3
Great Britain	610	3,863,897	688	4,234,475	248	1,777,473	1546	9,875,845	2511	15,717,828	965	5,841,983	37.2
Japan	53	252,303	72	473,808	78	469,323	203	1,195,434	637	3,268,490	434	2,073,056	63.4
Germany	154	900,633	107	803,221	49	280,888	310	1,984,742	498	2,943,297	188	958,555	32.6
Italy	82	587,242	39	305,997	9	164,443	130	1,057,682	433	2,611,259	303	1,553,577	59.5
France	95	612,096	53	333,444	34	308,992	182	1,254,532	410	2,407,361	228	1,152,829	47.9
	1033	6,475,234	1014	6,678,877	449	3,287,929	2496	16,442,040	5933	35,409,838	3437	18,967,798	
COMBINATION (*)													
United States	19	114,668	27	276,788	17	178,875	63	570,331	166	1,423,753	103	853,422	59.9
Great Britain	112	1,226,640	58	768,232	34	473,537	204	2,488,409	339	3,759,445	135	1,271,036	33.8
Japan	15	90,865	16	160,447	11	56,517	42	307,829	110	698,999	68	391,170	55.9
Germany	34	368,216	33	391,535	12	124,882	79	884,633	93	1,018,511	14	133,878	13.1
Italy	28	282,728	16	178,031	4	138,546	48	599,305	99	981,294	51	381,989	38.9
France	44	403,475	15	151,460	8	182,046	67	736,981	123	1,188,775	56	451,794	38.0
	252	2,486,592	165	1,946,493	86	1,154,403	503	5,587,488	930	9,070,777	427	3,483,289	
DRIGHTERS													
United States	12	80,975	3	16,506	4	25,666	19	123,147	937	4,622,113	918	4,498,966	97.3
Great Britain	413	2,067,819	496	2,512,672	164	914,752	1073	5,495,243	1792	9,340,091	719	3,844,848	41.1
Japan	38	161,438	46	234,190	58	322,956	142	718,584	502	2,360,449	360	1,641,865	69.5
Germany	117	517,979	67	368,712	35	135,126	219	1,021,817	385	1,794,154	166	772,337	43.0
Italy	43	236,508	18	94,191	3	6,952	64	337,651	270	1,301,468	206	963,817	74.0
France	40	140,546	25	102,793	23	91,486	88	334,825	250	987,821	162	652,996	66.1
	663	3,205,265	655	3,329,064	287	1,496,938	1605	8,031,267	4136	20,406,096	2531	12,374,829	
WEEKERS													
United States	8	63,420	25	234,638	10	82,269	43	380,327	341	2,415,737	298	2,035,410	84.2
Great Britain	85	569,438	134	933,571	50	389,184	269	1,892,193	380	2,618,292	111	726,099	27.7
Japan	-	-	10	79,171	9	89,850	19	169,021	25	209,042	6	40,021	19.1
Germany	3	14,438	7	42,974	2	20,880	12	78,292	20	130,632	8	52,340	40.0
Italy	11	68,006	5	33,775	2	18,945	18	120,726	64	328,497	46	207,771	63.2
France	11	68,075	13	79,191	3	35,460	27	182,726	37	230,765	10	48,039	20.8
	118	783,377	194	1,403,320	76	636,588	388	2,823,285	867	5,932,965	479	3,109,680	

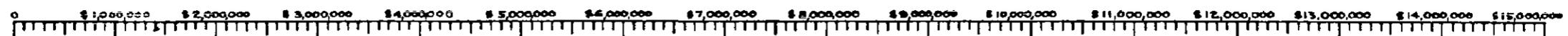
(*) Passenger & Cargo

(#) Special Types: Cable ships, Depot Ships, Ferries, Ice Breakers, Training Ships, Yachts, Floating Sea Bases, Floating Canneries and Vessels in Channel Service.

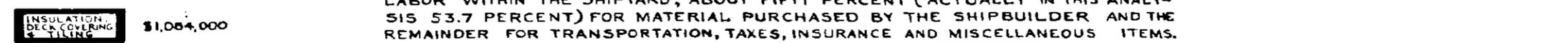
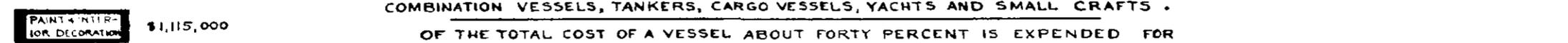
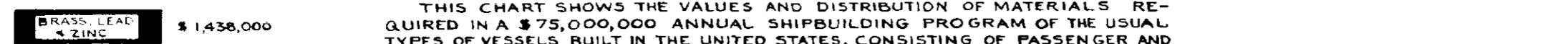
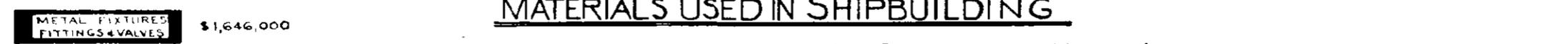
Prepared by
National Council of American Shipbuilders
January, 1938

ALABAMA IRON ORE LIMESTONE COAL CANE FIG IRON STEEL COTTON YELLOW PINE	ARIZONA COPPER ORE SILVER LEAD ZINC LEATHER WOOL	ARKANSAS ASH LUMBER YELLOW PINE COTTON PETROLEUM BAUXITE	CALIFORNIA STEEL MACHINERY HARD & SOFT WOOD PETROLEUM RED LEAD INSULATING PAPER GLASSWARE ASBESTOS WOOL CEMENT	COLORADO COPPER ORE LEAD SILVER ZINC WOOL	CONNECTICUT HARDWARE CUTLERY SILVERWARE CHAIN PIPE FITTINGS LOCKS & GALVES BRASS PRODUCTS LIGHTING FIXTURES TOOLS VALVES & FITTINGS	DELAWARE STEEL IRON CASTINGS MACHINERY ANCHORS CLAY PRODUCTS	FLORIDA LUMBER NAVAL STORES VENEERS	GEORGIA COTTON YELLOW PINE TURPENTINE CANVAS	IDAHO LEAD SILVER ZINC MANGANESE LUMBER	ILLINOIS IRON ORE LIMESTONE COAL CORE PETROLEUM PRODUCTS HARDWARE VALVES & FITTINGS PAINTS	INDIANA LIMESTONE COAL CEMENT OAK LUMBER ALUMINUM PUMPS ELECTRIC MOTORS	IOWA COAL CLAY PRODUCTS FIREBRICK CEMENT GYPSUM FURNITURE	KANSAS ZINC PETROLEUM LEATHER GLASS PRODUCTS	KENTUCKY HARDWOODS COAL PETROLEUM FIREBRICK LEATHER HEMP
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WYOMING
IRON ORE
FUEL OIL
WOOL



WISCONSIN
IRON ORE
ZINC
WHITE PINE
WOOD PULP
PLYWOOD
MACHINERY

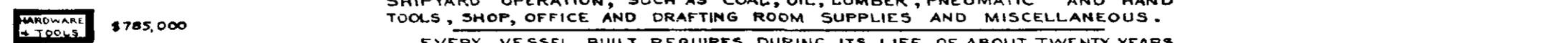
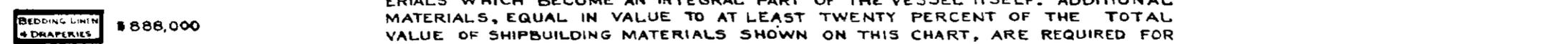


WEST VIRGINIA
COKE
COAL
OIL
PORCELAINS
STEEL CASTINGS
LUMBER

WASHINGTON
OREGON PINE
CEDAR
SPRUCE
CEMENT
MACHINERY
WIRE ROPE
VENEERS

VIRGINIA
COAL
IRON ORE
SHEET ALUMINUM
EMERY
MICA
MACHINERY
OFFICE SUPPLIES

VERMONT
MACHINERY
LUMBER
MARBLE
LIME
ASBESTOS
PLYWOOD
PAINTS
TOOLS
STEEL WIRE



UTAH
COPPER ORE
SILVER
LEAD
ZINC
WOOL



TEXAS
COTTON
WOOL
PETROLEUM PRODUCTS
SOUTHERN PINE
ASH LUMBER



TENNESSEE
COAL
IRON ORE
LUMBER
MACHINERY
COTTON
ENAMELWARE

SOUTH DAKOTA
CEMENT
WOOL
HEMP
LINSEED

SOUTH CAROLINA
COTTON PRODUCTS
NAVAL STORES
CANVAS

RHODE ISLAND
CLAY PRODUCTS
LIME
GRAPHITE
TEXTILES
MACHINERY
HAND TOOLS

PENNSYLVANIA
COAL
STEEL PRODUCTS
CEMENT
GLASS PRODUCTS
MACHINERY
HARDWARE
TOOLS
MACHINERY
REFRIGERATING
APPARATUS
PAINTS

OREGON
OREGON PINE
SPRUCE
CEDAR
MACHINERY
COPPER WIRE
CEMENT

OKLAHOMA
COTTON
LEAD
ZINC
FUEL OIL
LUBRICANTS

OHIO
IRON PIPE
STEEL PRODUCTS
LIMESTONE
RUBBER
MACHINERY
PAINTS
VARNISHES
ANCHORS & CHAIN
HARDWARE & TOOLS
HEATERS
EVAPORATORS

NORTH DAKOTA
CLAY PRODUCTS
COAL
WOOL
HEMP
LINSEED

NORTH CAROLINA
COTTON GOODS
CANVAS
LUMBER
COPPER
ALUMINUM
MICA
FURNITURE
VENEERS

NEW YORK
MACHINERY
MANUFACTURES
TEXTILES
WOOD PULP
ROPE
TELEPHONES
ELECTRICAL
APPARATUS
GLASSWARE
CERE
ASBESTOS

NEW MEXICO
COPPER ORE
ZINC
PETROLEUM
WOOL
MICA

NEW JERSEY
MANUFACTURES
MACHINERY
GALLEY EQUIPMENT
FANS, PUMPS ETC.
GLASS
PAINTS
VARNISHES
FURNITURE
BOTTLES
POTTERY
BATH FIXTURES

NEW HAMPSHIRE
CLAY PRODUCTS
MICA
SILICA
ASBESTOS
MACHINERY

NEVADA
COPPER
SILVER
ZINC
MANGANESE
WOOL
LUMBER
LEATHER

NEBRASKA
CLAY PRODUCTS
LEATHER
WOOL

LOUISIANA
YELLOW PINE
CYPRESS
OAK
COTTON
PETROLEUM
ROPE
GUM

MAINE
LUMBER
CLAY PRODUCTS
WOOD PULP
PAPER
WINCHES
WINDLASSES
STEERING GEARS

MARYLAND
COAL
IRON PIPE & PIPE
STEEL PLATES
STEEL WIRE
BRASS & COPPER
TUBES & SHEET
CANVAS
TIN PLATE

MASSACHUSETTS
TURBINES
ELEC MACHINERY
PUMPS & FITTINGS
LEATHER BELTS
RUGS & DRAPES
MANILA ROPE
NAVIGATING
INSTRUMENTS
INSULATING PAPER
PUMPS

MICHIGAN
IRON ORE
LIMESTONE
CEMENT
COPPER PRODUCTS
WHITE PINE
PLYWOOD
HARDWARE
TOOLS
FURNITURE
PAINTS

MINNESOTA
IRON ORE
FIG IRON
CLAY PRODUCTS
WHITE PINE
FLAX
LUMBER

MISSISSIPPI
COTTON
YELLOW PINE
VENEERS

MISSOURI
MACHINERY
LEAD
ZINC
CEMENT

MONTANA
COPPER ORE
ZINC
SILVER
MANGANESE
WOOL
LUMBER
LEATHER

MATERIALS USED IN SHIPBUILDING

ALL STATES PRODUCE MATERIAL OR EQUIPMENT USED IN SHIPBUILDING, AS SHOWN IN MARGIN.

THIS CHART SHOWS THE VALUES AND DISTRIBUTION OF MATERIALS REQUIRED IN A \$75,000,000 ANNUAL SHIPBUILDING PROGRAM OF THE USUAL TYPES OF VESSELS BUILT IN THE UNITED STATES, CONSISTING OF PASSENGER AND COMBINATION VESSELS, TANKERS, CARGO VESSELS, YACHTS AND SMALL CRAFTS.

OF THE TOTAL COST OF A VESSEL ABOUT FORTY PERCENT IS EXPENDED FOR LABOR WITHIN THE SHIPYARD, ABOUT FIFTY PERCENT (ACTUALLY IN THIS ANALYSIS 53.7 PERCENT) FOR MATERIAL PURCHASED BY THE SHIPBUILDER AND THE REMAINDER FOR TRANSPORTATION, TAXES, INSURANCE AND MISCELLANEOUS ITEMS.

THE TOTAL VALUE OF THE SHIPBUILDING MATERIAL AND EQUIPMENT IN THIS \$75,000,000 PROGRAM IS \$40,264,200 OF WHICH ABOUT \$30,000,000 IS EXPENDED FOR LABOR BY THE INDUSTRIES PRODUCING THIS MATERIAL AND EQUIPMENT.

THE MATERIALS SHOWN ON THIS CHART REPRESENT ONLY THOSE MATERIALS WHICH BECOME AN INTEGRAL PART OF THE VESSEL ITSELF. ADDITIONAL MATERIALS, EQUAL IN VALUE TO AT LEAST TWENTY PERCENT OF THE TOTAL VALUE OF SHIPBUILDING MATERIALS SHOWN ON THIS CHART, ARE REQUIRED FOR SHIPYARD OPERATION, SUCH AS COAL, OIL, LUMBER, PNEUMATIC AND HAND TOOLS, SHOP, OFFICE AND DRAFTING ROOM SUPPLIES AND MISCELLANEOUS.

EVERY VESSEL BUILT REQUIRES DURING ITS LIFE OF ABOUT TWENTY YEARS EXPENDITURES FOR FUEL, FOOD, UPKEEP AND REPAIRS IN AMOUNTS DEPEND-ING UPON THE SIZE, SPEED AND SERVICE IN WHICH ENGAGED.

"The Shipbuilding Industry"

by Mr. H. Gerrish Smith

Discussion

October 21, 1938

Q -- What is the usual method by which individuals pay for ships of high value occupying a long period of construction?

A -- It's usually paid based on the number of payments based on the period of construction. An approximate formula is worked out taking into account the steel work, drafting, and there is built up from it and from the bills for ^{items} ~~terms~~ that have been purchased and paid for. The expenditures against the builder are charged and he is permitted under his contract perhaps to build on twenty payments, possibly fifty, depending on the size of the contract and the amount of any financing it means as he goes along.

Q - You touched upon labor organizations in shipbuilding. What has been the extent of union ^{growth} and especially the C.I.O.?

A -- One of our shipyards is working directly under an agreement with the C. I. O. as recognized labor organization of that yard. Other yards have gone on one or two steps ahead. One of them is now operating a different agreement but the organization of their own employees seems to be growing at the various yards as some of them are under either the C. I. O. or the A. F. of L. or some other organization except one of their own creation.

Q -- Mr. Smith, I happened to be talking to an Englishman the other day and we were talking of the Queen Elizabeth and the record for crossing the Atlantic. He stated that the English, in great secrecy, apparently, were building one or two very fast ships, very much smaller, which would effect

the crossing in something like two and one-half days Do you think such a ship is practicable or do you have any information on it?

A -- So far as I can see, it's not practicable for the carrying of any number of passengers We might have a destroyer or something of that kind. I'm not sure you could carry fuel enough to cross; I think it's more or less a dream, although it is true that the French are now talking about building a second Normandie or a modified Normandie that will make thirty-four knots. The Normandie now crosses in less than five days, to get the lightest advantage, you have got to cut off another day, because of tides as a matter of fact, I crossed on the Normandie this summer and she had to slow down to around twenty-eight knots, whereas she could easily maintain forty For three half days she had to get her speed down for fear of hitting in too early.

Q -- With reference to the standardization of types and the simplification of plans, are any commercial companies at the present time using standard types in which they use the same plan over and over again, such as makers, and to what extent could prefabrications, such as was done during the war, be used advantageously in case of an emergency?

A -- As far as standard types for commercial practice is concerned, I think that is a matter to which all shipbuilding interests have contended the last fifty years Great study has been given to it and it has finally been given up so far as ownership is concerned in securing from them any considerable number of ships in exactly the same type. The nearest approach we have to it at the present time is that when these vessels are built for the Maritime Commission, while they have the same hull forms and many of the characteristics are the same, they are being built by different companies

they have three different types of machinery, with the result that that effort to secure some degree of standardization is modified by the different machinery designs which effect the very substantial parts of the ship. As far as private owners of ships goes, they have seldom built more than two or three ships that are sufficiently near to the same design to make it possible to use to any large degree the same plans for either the whole or part of the machinery. There have been instances where two or three and sometimes four ships have the same plans, but that is about the limit. During the war period there were a large number of ships built from the same design like the Hog Island ships, fifty of one type, and on the Great Lakes there were thirty or forty. That, of course, lent toward a quicker delivery by virtue of the fact that I said, the plant^S produced^{for} one^{are} available for all. As far as present fabrications are concerned, I'm still to be convinced that there is anything to it. As Hog Island has adopted the prefabrication process to some degree, we are building a specialized product like a shoe to fit your foot or automobile in which you want a special body to suit your requirements. We've got to have the job pretty well under your own control all the way else you're apt to have problems arising that might have been avoided if it had been under such control. Prefabricated material necessitates shipping curves^{d shapes}. Smaller carload lots^{make}/heavier hauling charges. I doubt myself whether the annual production of the prefabricated parts in the steel mills can be done as cheaply as it can in the shipyard. In some cases in which there are actual figures, I proved to the owner that if he accepted prefabrication that he was going to pay more money than he would otherwise. Those are my own personal opinions based on experience with shipbuilding. I haven't got the figures to prove it.

Q -- Do you think that in an emergency there will be any further development in concrete ships?

A -- Personally, I doubt it. Of course, I'm afraid I'm a conservative but I think an emergency is the wrong time to start building concrete ships or any other of untried types. They should start building them right now to be assured of being satisfactory and when the next trouble comes, be assured that that type is going to be of some service when built. We built some concrete ships during the war and their record is not praiseworthy. We built an awful lot of wooden ships because there were a lot of people who had lumber to sell and they have all been burned or scrapped with a very few possible exceptions and there were a lot of them but they were not suited for the Trans-Atlantic trade that was needed during the World War. My own belief is that the regular type of steel ship will get further and further by sticking to tried types and not taking too much chance in an emergency.

Q -- With the higher cost of material and labor in this country, how do we compete with foreign markets for shipping trade?

A -- We compete solely through Government subsidy that at the present time is paid for by Government permits under the Merchant Marine Act of 1936. These permits allow an owner to buy a ship in the United States at what they determine to be as close as possible to the foreign price for a ship to compete in the same service and the Government carries the balance and as a subsidy will always pay the operator a difference in the cost of operation. There is no alternative and I don't believe there ever will be an alternative as long as our living level is on the grade it is compared with foreign nations because this old question of change doesn't apply when you come to building what I describe as a highly specialized product like a ship where

it depends on the labor output of each and every man. While I think that on occasion we may be getting a little more efficiency out of our labor, I doubt if it's safe to say we can produce any more man ^{per} ^{than} for man as foreign nations who are building more ships than we are. If the maintenance of this foreign trade is an important economic factor which I think it is, and constitutes about ten per cent of your business in the United States, then there is justification for a subsidy to maintain American ships. There is no justification of a subsidy except for the broad economic factor involved and for the factor of national defense, (if) ^T that is the only way we can have ships and the types of ships we need in an emergency and the expenditure is comparatively moderate for a maintenance of the necessary service.

Q -- How, in your opinion, will the future bombardment air plane effect future types of seaplanes?

A -- That is too much of a technical problem and a problem for those who are engaged in the design of our Government ships. It naturally involves a type of ship that has not been designed in years past.

Q -- Mr. Smith, apparently in these smaller ships running from a hundred tons gross up perhaps to a thousand gross tonnage, the individual builders can compete largely with the shipyards. I wonder at what tonnage the shipyards had the advantage there - say, 2,000 tons?

A -- It follows that builders of small craft as a rule, I think, find they get perhaps a little more than a dollar return for a dollar spent. They stick pretty close to their types. They try to keep out of the sea-going vessel type. They are perhaps eight or ten yards in the United States that build sea-going vessels and that is about the maximum. All of the rest of them are confined to the building or repair of vessels of much

smaller size

Q -- I believe the last subsidy law limited the subsidy to firms which paid no salaries greater than \$25,000 a year. How many firms will that apply to?

A -- The law as it is written is that if you are building a ship for the Maritime Commission you can't charge more than \$25,000 salaries or the proportional part of it against that ship. That is, if the one-quarter of your work was Maritime Commission work and the rest was general work, all you could charge the Maritime Commission would be \$6,250, one-quarter of \$25,000.

Q -- You spoke about some of the fixed costs of the shipping industry being allowed by the Maritime Commission. Is there any board of arbitration set up to set those due?

A -- As far as the Maritime Commission is concerned, they have not yet reached a point where that has been worked out in connection with any contracts. They haven't been confronted with the settlement and that is as far as the shipbuilders are concerned on naval contracts, although the act dates back to 1934, but it's a long and tedious process before you can submit your final reports and you're allowed under the law a report just what is going to happen with the Maritime Commission, I'm unable to say ^{been} they have/privileged under the law to establish their own determination of what is cost and what is not in this determination of the profit, and delegated by the Navy Department to the press. ^{Treasury?}

Q -- How would the profit over the fixed cost compare with the Navy contracts as applied to shipbuilding?

A -- They are hopeful of making something with the possibility of

eliminating the difficulty we had in the last war - the inability of the Government to reach any agreement with shipbuilders as to the cost of their ships during the war. I wondered about that In the event of another emergency it would be necessary to contract on some basis of a direct fee payable first if you are going to build in a great hurry under very uncertain circumstances You have no idea of what it is going to cost and you might ruin an industry and put it out of business unless it had some reasonable assurance it would get some definite return for its efforts.

Q -- Does the cost of naval shipyards carry on in time of peace and afford an adequate yardstick to gauge prices of ships?

A -- No, I don't think they do. They have tried for over twenty years past which I have participated in on a great many occasions to try and get an exact comparison between what the cost is to the Government for a ship built in a Government yard and a ship built in a private yard It's a matter of taxes, a matter of insurance, a matter of depreciation. A great many other matters come into the picture that make it a very difficult problem. There is a closer understanding of the difference today than there ever has been before. Ships take a long time to build and if they overlap by a year that shipyard might be in a favorable period and a private yard in an unfavorable period. When the final returns come in say 3 years, 4 years, 5 years after the contract is entered into, a great deal of the discussion entered into at the time it was entered into is forgotten and it is more or less cold and is not of much value.

Q - You remarked that the industry was entirely ample to take care of the needs for completed items to go into ships. Some one who came here said they had some difficulty in getting large motors to go with their

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products Have you had any experience in that regard - being held up because of late deliveries?

A -- There are always what you might call reasonable temporary delays and delays that have a great many factors involved such as getting plans promptly approved. If not, who is responsible for delaying the Government - the private builder or the sub-contractor Of course, the aeronautical equipment is going ahead with leaps and bounds I'm not very familiar with its demands and its ability to secure its material - that's a little outside the shipbuilding field I should presume that where there are large groups of machines, if they have somewhat new designs or motors, there might be some delay There is always some delay, of course, in building a ship for the reasons I stated but it's not what you'd call a fundamental delay, inherent in the business, but simply due to circumstances over which there may be no control or over which various people have responsibility.

Q -- You mentioned that the detailed plans in preparation for the airplane carrier amounted to \$2,000,000, that is an appalling figure to me Is it possible you could give a slight background as to what it went into?

A -- In the first place, an airplane carrier is a big ship. Each and every plate and piece of steel has to be detailed as to size and shape. Each and every feature of the design has to be detailed, both in the way of general plans and in the way of detailed plans All of the piping throughout the ship for all purposes - steam, fire, water, supply, general service - all has to be detailed just the same Your electrical equipment from one end to the other together with all of the equipment that is purchased and built, all have plans to be submitted for approval; in the most important plans they have to come to Washington for sanction by the

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department concerned. It is necessary delays, changes, differences of opinion, that take a long time to reconcile, which means delay and cost and all of those factors are what is involved in the present day shipbuilding industry which always existed to some extent but nothing like the extent to which it exists now.

Q -- How long a period of time does that cover?

A -- You can figure that the last plan will be delivered a few hours before the ship is delivered. It may be for a small detail. Of course, your important plans start the ball when you get the contract and sometimes before you get it, and when you think you're going to get it and the large bulk of them, of course, have to be wholly completed within the first fifty per cent of the period of construction, but there is planned work all the way through. Gradually, however, it tapers off to smaller items.

Q -- From the time when you get the contract to the time you start laying the keel, about, on an average, what time will transpire?

A -- It depends on the ^{type} ship of ship. A battleship won't begin much before six months. You have got to get plans out and get them approved, then order the material, in advance of your approved plans, otherwise you're sure of having a percentage of waste that involves them. The laying of the keel is a fictitious date in a way, to my mind, it's much better to hold off until you have enough material that you can lay out a program of construction and go straight ahead. If you lay it too early, you've got men fiddling around doing this job and that and making comparative little progress and you're waiting for material that hasn't come in to carry it out as a regular program of construction. So my motto has always been, hold up on laying the keel until you can see a chance to go straight ahead and push the vessel

right through construction

Q -- Assuming you will have delay of six months before you can start building the large ship, how much could the industry expand without a large increase in the present existing plans? ^t What increase in capacity might be expected in building battleships?

A -- Of course, they are a big boat A battleship will be on the ways a long time, probably two years, maybe longer If you are building vessels of smaller types, you can control, to a considerable degree, the length of time on building ~~waste~~ ^{ways}. As for instance, during the World War one plant that had a large group of destroyers was occupying a building was allowed about four months only for each one, whereas in peacetime, with the new destroyer of new times, they had been on the ways eighteen months.

Q -- If you can cut down your launching time to that, what occupancy or capacity have you available? I mean, with the present day system, how many major ships could be taken in hand in case of an emergency?

A -- Well, I would think if you put more than two of the present day battleships in, you'd have about all you could handle You'd have to add additional facilities and build up a larger force and ~~plant~~ ^{plant} equipment In addition, you'll have the navy yard facilities which are building battleships at the present time

Q -- Are plans submitted on a very general basis and then detailed as to specifications?

A -- There is quite a detailed specification and many general specifications developed over a period of years, all of which come into the picture and then a series of general plans showing the general layout of the ship, perhaps ventilation, size, ~~type~~ ^{type} machinery, layout, some general piping plans,

but very little in detail except for what may have been pretty close to standardized equipment.

Q -- Do you find any cause for complaint as some industries do that the Government form of invitation for bids puts a very heavy expense on the unsuccessful ^{bidder} builder and that he has prepared detailed plans which may or may not be accepted?

A -- That is very true An unsuccessful ^{bidder} builder is subjected to a very heavy expense in connection with the bid on a present day large size Government ship of any type, particularly on a battleship, airplane carrier, or cruiser If he is unfortunate enough not to get the contract, he is out of pocket a few thousand dollars.

Q -- Is it possible to reduce that cost to the industry in submitting a bid?

A -- I don't know how it could be done unless the Government would say that they would pay the unsuccessful bidder so much for the preparation of plans. This has been done in the past in the case of commercial ships on a few occasions.

Colonel Jordan -- I'm glad to have this opportunity, especially for the very satisfactory answers to the questions that have been asked, but as to a question - over in the Transportation Division we had some very pleasant business contacts with Mr. Smith and every time I asked him a question he always asked me a harder one and I had to call in my assistants to answer it, so I think I won't ask any

Colonel Riefkohl -- On behalf of the Army Industrial College, I wish to thank you for this interesting and constructive talk, Mr Smith.