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THE ARMY INDUSTRIAL COLLEGE
Washington, D C

Course 1937-1938

THE SHIPBUILDING INDUSTRY

by

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January 17, 1938

AIC 152(2/15/38)23

THE SHIPBUILDING INDUSTRY

It was my privilege last year to address The Army Industrial College on the subject of shipbuilding, and in appearing before this class I shall naturally repeat certain facts relating to the industry which were cited last year and which do not materially change from year to year

SHIPPING

World Tonnage

Shipping and shipbuilding are, of course, closely related. The shipbuilder provides the vehicle and the ship operator provides the service for trade. A few facts as to the present status of American shipping are helpful to a discussion of the shipbuilding problem.

There is attached to this statement Exhibit "A", showing the total seagoing tonnage of vessels each of 2,000 tons gross or greater of each of the leading maritime nations at the end of 1936, also the gross tonnage built by each of these nations in five-year periods beginning January 1, 1922. This tonnage is divided into ships of the combination passenger and cargo type, cargo ships, and oil tankers. Vessels in both the foreign and domestic trade are included, although Great Lakes and special type vessels are excluded. United States tonnage includes about 1,000,000 gross tons of idle tonnage owned by the Maritime Commission. Fully one-half of the United States tonnage is in coast-wise and intercoastal trade, whereas most of the tonnage given for other nations is in the foreign trade.

Age of United States Vessels

The average effective life of a ship the world over is taken 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 nearly eighteen years old, 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, while the tanker tonnage is 84 2 percent. The only 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, competing in foreign trade with 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 vessels 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 so far as age is concerned.

New Construction

The last report of Lloyd's Register of Shipping shows 2,902,345 gross tons of ships actually under construction throughout the world at the end of September, 1937. This construction by nine leading maritime nations is as follows.

Great Britain	1,184,635	Gross Tons	
Germany	383,468	"	"
Japan	334,530	"	"
Holland	224,726	"	"
UNITED STATES	216,028	"	"
Sweden	114,020	"	"
Denmark	103,450	"	"
Italy	83,150	"	"
France	70,284	"	"

This report shows that the United States stands number five in the building of merchant tonnage at that date with 7-1/2 percent of world tonnage under construction, but with an average of only 3 6 percent of world tonnage construction over a period of five years. These figures, however, are apt to be very misleading unless thoroughly understood. In the first place, they cover all vessels above 100 tons gross that have actually been begun. So far as the United States is concerned, however, the seagoing tonnage building as of

September 30, 1937, consists wholly of oil tankers, the remainder consisting of small craft such as vessels for bay or river service, barges, towboats, ferries, etc

Since the last Lloyd's report a contract has been placed in the United States for one large combination, passenger and cargo vessel for the United States Lines, the only commercial seagoing vessel of the general cargo or passenger and cargo type building in the United States today. In fact, with the exception of the 31 combination passenger and cargo vessels and two vessels of special type (freight-car carriers) built under the Merchant Marine Act of 1928 no other vessels for the foreign trade have been built in the United States for the past fifteen years

The present deplorable condition of American shipping in our foreign trade is well presented by the United States Maritime Commission in its "Economic Survey of the American Merchant Marine" of November 10, 1937

Shipping in Domestic Trade

While our shipping in domestic trade is also nearly obsolescent, it 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 in this connection 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, inclusive.

	Volume in Tons		Value	
	1929	Average 1930-5	1929	Average 1930-5
American	39.8	35.6	33.1	35.3
Foreign	60.2	64.4	66.9	64.7
	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

The participation of the United States in world 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 nearly 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 shipbuilding and shiprepairing and the two should be considered together, and 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 and 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 ships produced in the United States in twenty years. Large expenditures for special machinery in the production of repeat parts in the automobile industry would be justified, whereas such expenditures for the production of the few like parts that might go into 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.

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 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 the 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 \$1,000,000 would give employment to about 500 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 a year ago discloses that there are now 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.

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 service on the Lakes. The maximum size of vessel that can pass through the locks and 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 Waterway, under consideration for the past few years would admit 87 percent of world tonnage to the Great Lakes.

Shipbuilding On The Great Rivers

So far as the Great Rivers are concerned, there are ample facilities for building vessels of all the types 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 on these Rivers. 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 we class as the seagoing type, except a few Government vessels that may be built on the Rivers and then go out for service elsewhere.

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 of the available building ways in private shipyards are occupied at present by naval 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 could 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.

Taken as a whole, there are ample facilities in existing private shipyards of the United States to take care of any probable peace time naval and merchant shipbuilding program.

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.

Ship Repair Facilities

There are at the present time ample 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 care for ships of 500 feet and over.

Total. 318

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 business, 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.

Employment

Although the United States has been building almost no seagoing commercial vessels except oil tankers for several years, employment in the industry has been continually on the increase because of naval and other government construction, oil tankers and miscellaneous small craft. 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. I believe this figure at the present time to be on the under rather than on the over side. It is higher than at any previous time since the completion of the World War program and in some trades is now utilizing the available supply of men familiar with shipbuilding, so that the industry is faced with the development of additional men from 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 \$700,000 or more. Shipyard estimates of

the cost of plans for the 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 peace time is always very small.

A factor of general 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.

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. A few figures to show the average labor rate in the industry by six months periods from June, 1933, to June, 1937, and for the months of July, 1937, to October, 1937, as reported by the Bureau of Labor Statistics, Department of Labor should be convincing as to a sub-

stantial 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	754
Dec. 1936	.794
June 1937	.803
July 1937	816
Aug 1937	.817
Sept. 1937	832
Oct. 1937	.830

New Developments in Shipbuilding

The one 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, car-floats 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 a tanker 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 of completely welded construction This vessel has already been launched Orders for two similar vessels have since been placed, making at the present time three tankers of over 18,000 tons deadweight under construction with the tank spaces completely welded

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

Private Shipyard Construction of Government Vessels

With a very few exceptions 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 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. At the present time the naval shipbuilding program is divided approximately one-half to the private shipyards and one-half to the Government navy yard. 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

The recommendations of the Committee on Munitions, of Congress, of which Senator Nye was chairman, were for one hundred percent navy yard building. 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 last March. 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.

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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

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States is to continue to have a merchant fleet in foreign trade under private operation

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

* * * * *

Colonel Jordan You made the statement that the main contractor shipbuilders were not subject to the Walsh-Healy Act Is that correct, sir?

A Yes, sir. But the sub-contractors of private shipbuilders who have a direct contract with the Navy Department do come under the Act. It is a very curious situation, in this way If a private ship contractor takes a contract for a Government vessel and buys a boiler or a piece of machinery from a particular sub-contractor neither the private ship contractor nor the sub-contractor are responsible If the Navy Yard itself builds a vessel and contracts for that same type of boiler from the same sub-contractor the latter is responsible under the Act

Colonel Jordan Are there any questions, gentlemen?

Q Mr. Smith, in your opinion how will the construction differential subsidy work, considering the extreme difficulty of obtaining accurate shipbuilding costs in foreign yards? In other words, do you consider this type of subsidy practicable and workable?

A I think it is practicable but it can never be determined completely and accurately When the present Act was first under consideration I made the recommendation to both committees of Congress that dealt with that legislation that they should fix arbitrarily the differential as a fixed percentage of cost in the United States, and let it go at that, making the best estimate practicable because of the difficulty of getting a reasonably accurate figure The differential is extremely difficult to get but it can be approached with some degree of accuracy

Q. The first six month period in war, Mr. Smith, is a more or less critical state Supposing we had our

plans all prepared for a ship that is an acceptable type and we could prefabricate some of the material in steel plants and elsewhere, how many ships do you think we could actually get afloat at the end of six months' time, that is, only an estimate?

A Well, starting from scratch you would have difficulty in having very many ships available at the end of six months I think you ought to say eight months at least. Then I believe you could get a fairly substantial number of a standard but not too complicated a design of general carriers or those that might carry troops if need be.

Q What do you mean by a substantial number, ten or twenty?

A It is pretty hard to tell I think twenty or thirty ships might be produced in an eight months' period if you had all plans ready ahead of time

Major Gano. Mr Smith, during the World War in building a ship one of the greatest procurement problems was the supply of turbines, I believe In view of the increased number of ships that are now using Diesel power, do you believe that we would have the same trouble in procurement of turbines in time of war or would that trend toward Diesel alleviate it?

A I doubt whether you would have much trouble at the present time or in the future, because of added facilities for the construction of turbines in the United States I wouldn't anticipate any serious difficulty in that respect It would be, I think, a factor that would be about as controlling, however, as the actual construction of the hull of the ship itself. You would have to have all of your designs ready so as to start from scratch in order to make real progress on the construction of the machinery as well as the hull.

Q I would like to ask one more question relative to Diesel construction The Quartermaster Corps has a prospective for 24 knot Diesel transports and we have been wondering whether or not that is a little bit too great in speed for a ship of any size Are any of these new ships coming out going to be of Diesel propulsion?

A I believe the call for bids on freighters by the Maritime Commission asks for alternate bids on a certain

or expect that we will be more nationally sympathetic toward the matter of shipping in general than we have been during the past thirty or forty years perhaps?

A I think we have been very much more sympathetic to shipping since the World War and aside from existing labor situations aboard ship today, which are not good, and about which you read plenty in the press, there is no question but what we can secure men who are perfectly competent and perfectly good for running our American ships. The greatest difficulty, of course, is in the steward's department where in the past we have had mostly foreigners, but stewards do not need to know much about the operation of ships. They have to know about food, cleaning, and things of that kind. But this question of sea-mindedness has improved vastly since the World War. It started in 1914 when the farmer discovered he couldn't get his wheat to market because there were no ships to carry it. All of the ships that had been carrying our products were taken over for war uses by the nations at war, and the amount of money lost was very great. It has been estimated at \$400,000,000 in that one year. I have no way of finding out what it really was. But that was the beginning and was a real eye-opener as to the necessity of having our own ships for the carriage of our goods. In a survey made just before the Act of 1928 the Shipping Board visited some sixty odd cities throughout the United States to ascertain local sentiment as to the need for a merchant marine and they came back with a one hundred percent recommendation that shipping in our foreign trade is essential for the good of the nation. It is essential that we should have American ships to carry a substantial part of our goods in order to exercise that control over them that is necessary to reach our markets and expand them.

Colonel Jordan. Gentlemen, are there any further questions? Captain Williams, we would like to hear from you. Won't you please say something?

Captain Williams. The subject has been thoroughly covered and I think I have been very fortunate in being able to hear it. I know of no one who is better qualified in this country than Mr. Smith, and I think he is probably the highest authority, and we were all very fortunate to have had the privilege of hearing the talk. It was given in such a very interesting and comprehensive manner.

Captain Furer I don't believe there is anything that I could add I was very much interested On my last tour I was Assistant Attache in London, and I am attempting to prepare the cost of shipbuilding in Great Britain as against the costs in the United States In the figures that I have the cost of labor has gone up in the United States and somewhat in Great Britain but I found that about a year and a half ago we paid \$1.07 per hour for every hour of work in Navy yards on the average I had figures to compare between dock yards and Navy yards in the United States, but in a general way the ratio was developed the same in the private industry and in all trades That took into account, of course, leave with pay, holidays, and all of those things, but for each hour that a man worked on the average in the Navy yard it cost the Government \$1.07 an hour In Great Britain, assuming the pound to be worth \$5 00, which is approximately correct, the Government paid its mechanics on the average 34¢ an hour In other words, the cost of labor was about three times as high in the United States as in Great Britain That ratio would no doubt prevail in all of the trades that provide for ship yards and dock yards, material, machines, etc Now, you would expect that United States Government ships would cost about three times as much as they do in Great Britain, but that is not true They don't cost three times, they cost between two and two and a quarter times I tried to ascertain why that difference, and I found it was largely due to the greater efficiency in handling materials in our shipyards That was the biggest item, I thought, the handling of materials and the greater efficiency of anything that was in the nature of mass production. But when it comes to merchant ships, etc , it is very hard to get figures as to just how much the American merchant ship costs compared to the British I found, for instance, that output on riveting and things of that kind that you can compare is higher in America than in British or in continental shipyards The ratio isn't quite the one between labor direct

Colonel Jordan I want to ask a distinguished graduate of this school, Commander McDowell, to say something

Commander McDowell I think I will have to repeat what was recently said, that I have enjoyed it very much

A 100
745
A 500

Colonel Jordan We have another visitor here, a gentleman I heard talk at a meeting at the Mayflower not very long ago, the Assistant to the Assistant Secretary of the Navy Mr. Compton, won't you please say something?

Mr. Compton I can only say that I consider it a genuine privilege to have been able to attend this meeting at the Industrial College this morning, and particularly to hear the able talk by Mr. Smith The work of the College is one that we know of in the Assistant Secretary's office Mr. Edison knows of it We have followed it very closely although we haven't had an opportunity before this date of attending one of your sessions I think the work the College is doing is a splendid and a very necessary piece of work I have gotten a great deal of information out of my attendance here this morning and I appreciate the privilege I wish there was something of a technical nature that I could add to the meeting but I don't believe there is.

Colonel Jordan I want to extend to the Assistant Secretary of the Navy through you an invitation to come over at any time to any of our conferences We would be delighted to have you

Mr. Compton I am still working on my commitment along those lines, sir.

Colonel Jordan Mr. Smith, I want you to tell the class one thing before you let them go I want you to tell them some good news about the discipline on American ships on your trip to Europe and back We have heard so many outrageous things on the other side that a little bit of good will help out a lot Please tell them the story you told me

Mr. Smith Of course there has been a great deal said and there is a great deal being said about the discipline on American ships which at the present time in many instances is causing the ship operators and others extremely serious concern I think, however, that the large percentage of men aboard our ships would be more than glad to continue their work efficiently and without the disturbance that they get from those who are constantly inciting them to action against the captain and against the officers of ships and against operators

in general. It was my good fortune last summer, late in the summer, to make a round trip abroad, going over on the Washington and coming back on the Manhattan. They are two ships of the United States lines, two very outstanding vessels on the Atlantic. I naturally was watching very closely for instances of trouble, and I will say unhesitatingly on my own account and on the account of those with whom I talked that I saw no evidence of insubordination and heard of only one instance of impertinence and that was extremely trifling. I noted a willingness on the part of some of the ship's employees to speak freely about the present regrettable labor situation, and such individuals expressed only a wish for an opportunity to carry on with their jobs free from outside disturbance.

Colonel Jordan: Thank you, sir, and I want to tell you how much we appreciate your coming down here from New York and talking to the College. We are going to preserve the records that you have given us, the bound statements, and they will go in the annals of the College. Thank you a thousand times.

EXHIBIT "A"

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

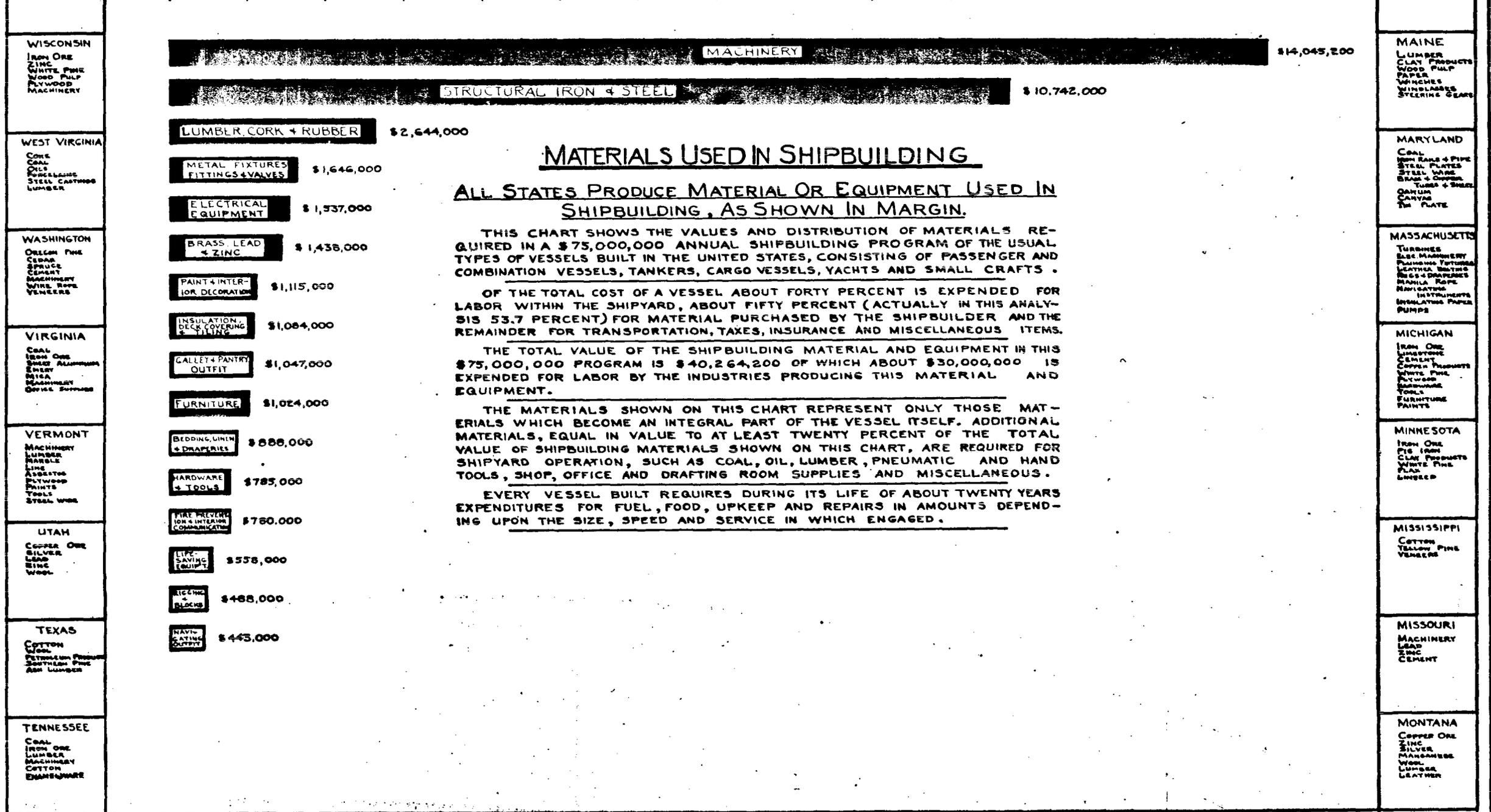
Countries And Types	Built Between 1/1/22-12/31/26		Built Between 1/1/27-12/31/31		Built Between 1/1/32-12/31/36		Total Built 15-Year Period 1/1/22-12/31/36		Total Fleet 12/31/36		Total Vessels and Tonnage Over 15 Years of Age		Percentage Tonnage Vessels over 15 Yrs. Bears to Total Tonnage
	No.	Gross 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	62	587,242	39	305,997	9	164,443	150	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	18,947,798	
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	788,232	34	473,537	204	2,488,409	339	3,759,445	135	1,271,034	33.8
Japan	15	90,865	16	160,447	11	56,517	42	307,829	110	698,999	68	391,170	55.2
Germany	34	368,216	33	391,535	12	124,882	79	884,633	93	1,018,511	14	133,878	13.1
Italy	28	292,728	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	132,046	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	5,337,488	930	9,070,777	427	3,483,289	
FREIGHTERS													
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	140,545	25	102,793	23	91,486	88	334,825	250	987,321	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	
TANKERS													
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	368	2,623,285	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 COPPER PIG IRON STEEL COTTON YELLOW PINE	ARIZONA COPPER ORE SILVER LEAD ZINC LEATHER WOOL	ARKANSAS ASH LUMBER YELLOW PINE COTTON PETROLEUM SAUHITE	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 CLOCK SCALERS 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 COPPER PETROLEUM PRODUCTS HARDWARE VALVES & FITTINGS PAINTS	INDIANA LIMESTONE COAL CEMENT CLAY LUMBER ALUMINUM PUMPS ELECTRIC MOTORS	IOWA COAL PRODUCTS FIREBRICK CEMENT GYPSUM FURNITURE	KANSAS ZINC PETROLEUM LEATHER GLASS PRODUCTS	KENTUCKY HARDWOODS COAL PETROLEUM FIRE BRICK LEATHER HEMP
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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 DEPENDING UPON THE SIZE, SPEED AND SERVICE IN WHICH ENGAGED.

SOUTH DAKOTA CEMENT WOOL HEMP LINSEED	SOUTH CAROLINA COTTON PRODUCTS NAVAL STORES LUMBER 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 LUMBER COPPER ALUMINUM MICA FURNITURE VENEERS MACHINERY ANCHORS & CHAINS HARDWARE TOOLS HEATERS EXHAUSTERS	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 TYPE TELEPHONES ELECTRICAL APPARATUS GLASSWARE COAL ASBESTOS	NEW MEXICO COPPER ORE ZINC PETROLEUM WOOL MICA	NEW JERSEY MANUFACTURES MACHINERY GALLEY EQUIPMENT PUMPS ELECTRICAL PAINTS VENEERS FURNITURE TEXTILES BATH FIXTURES	NEW HAMPSHIRE MICA SILICA ELECTRICAL MACHINERY	NEVADA COPPER SILVER GYPSUM LEAD ZINC MANGANESE SILICA WOOL	NEBRASKA CLAY PRODUCTS CEMENT LEATHER WOOL
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