THE STEEL INDUSTRY--ITS GROWTH AND PROBLEMS

7 April 1950

CONTENTS

Page

INTRODUCTION--Mr. A. H. Baum, Member of the Faculty, ICAF..... 1

SPEAKER--Mr. E. M. Richards, Vice President in Charge of Planning and Development, Republic Steel Corporation..... 1

GENERAL DISCUSSION..... 23

CHARTS--Number 1..... 33

Number 2..... 35

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THE STEEL INDUSTRY--ITS GROWTH AND PROBLEMS

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MR. BAUM: Gentlemen, the steel industry forms the backbone of our national economy. It has made the Nation a leader in world affairs. One of the world's foremost producers is the Republic Steel Corporation. This morning its Vice President in Charge of Planning and Development will speak to us on the timely and important subject, "The Steel Industry--Its Growth and Problems." It is my pleasure to introduce Mr. Earl M. Richards.

MR. RICHARDS: Mr. Baum and members of the armed forces: It is a real honor and pleasure to be here this morning. I think that is so because this organization did a very outstanding job during World War II. As I understand, it is widely recognized that the men in this group are specially selected men from the service all over the United States, and that you have the highest ranks in the educational field in the Department of Defense. So, as I say, it is an honor and a pleasure to be here this morning and to have the privilege of speaking to you about the steel industry.

The scope of steel is so wide that my remarks, of necessity, will be limited, first, to a few highlights on its development, and, second, to some of the present-day problems confronting the industry, particularly from the standpoint of national defense.

Iron and steel are of ancient origin. They were known and used long before the time of Christ. In fact, iron goes back to prehistoric times.

Since early times, conquering armies have used iron to their advantage. The Assyrian forces, at the height of their grandeur, about 705 B. C., were the first known armies to be equipped with weapons of iron. Subsequently, in 507 B. C., the Etruscan King, Porsena, after defeating the Romans, prohibited them from using iron except for agricultural purposes.

In our own country, the first successful iron enterprise was established in 1644 at Saugus, Massachusetts. In spite of the need of the early colonists for iron, production was small because of restrictions imposed by British colonial policies. In 1750 England issued an injunction against any new iron works in America, as well as forbidding the construction of any finishing facilities for iron. These restrictions may have been responsible, in some measure, for four iron masters signing the Declaration of Independence, and 24 men, identified with the iron industry, being prominent in Washington's armies.

As compared to iron, steel, on the other hand, is first mentioned about 340 B. C., during the reign of Alexander the Great.

The steels of antiquity were of two kinds, made by the cementation and the crucible processes. In the cementation process, iron bars were packed in material containing carbon and heated to a yellow heat, so that the iron, without actually melting, absorbed sufficient carbon. The crucible process consisted of melting wrought iron with carbon in a small container or crucible in which the molten metal absorbed the carbon. The production of these steels was very limited, being confined mostly to springs, swords, knives, and similar items.

During the Middle Ages these processes seem to have disappeared from use. They were revived centuries later, when the cementation process reappeared in Belgium in 1600 and the crucible process in England in 1742. For centuries the output of these steels dragged far behind iron. However, in 1856, less than 100 years ago, came the seeds of a new process, and with them a new expansive era for steel. These events were, first, the disclosure by Sir Henry Bessemer of his newly invented process, consisting of the blowing of air through molten iron to reduce the carbon and other elements to low values; and, second, the development by Mushet to make the Bessemer process practical by the addition of manganese after the blow, thereby producing steel. William Kelly, of this country, some years earlier originated a process similar to that of Bessemer, but Bessemer's name became identified with the process.

Other developments followed shortly. In 1862 Siemens attempted to make steel on an open hearth with his regenerative furnace, which he had previously developed for glass melting. In 1864 the Martin brothers of France were successful in making open hearth steel from a scrap pig iron mixture in the Siemens type furnace.

During this same era, alloy and electric furnace steels were also originated and developed. Alloy steel had its beginning in 1820, when Faraday and Stodart, through their investigations, made alloys by the crucible process from nickel, chromium, and rarer metals, for better cutting tools and steel for reflectors; but it did not experience its real growth until the turn of the present century. The electric furnace, on the other hand, was originated in 1878, when Siemens built the first unit of practical importance, and four years later succeeded in melting 20 pounds of steel in it. In 1886 Heroult developed his electric furnace, which is the basic design for our present electric furnaces.

Since these new methods of producing steel were only in their development stage during the Civil War, that war was fought with iron rather than steel. In 1860 the iron produced in the United States was 919,770 net tons, and steel was less than 2 percent of this amount,

that is, only 13,259 net tons. In fact, in 1863, the middle of the Civil War, the steel production was only 9,044 net tons. As a matter of comparison, the tonnage of this entire year was produced in this country during World War II in less than one hour.

After the Civil War, however, the steel industry grew by geometrical proportions, in the following ratios: 1, 2, 4, 8, 16, 32, 64, 128, and so on.

Starting in 1860 with a steel production of 13,259 net tons, the following table indicates the rapid growth of the steel industry in the United States:

YEAR	STEEL PRODUCTION INGOTS & CASTINGS (NET TONS)	ELAPSED YEARS TO APPROXIMATELY DOUBLE PRODUCTION
1860	13,259	-
1868	30,000	8
1870	77,000	2
1872	160,108	2
1875	436,575	3
1878	819,814	3
1881	1,778,912	3
1887	3,739,760	6
1897	8,015,792	10
1902	16,740,920	5
1912	35,001,459	10
1929	63,205,490	17
1948	88,640,470	-

Thus, in a matter of nearly 90 years, 1860 to 1948, the increase in steel production was almost 7,000 percent; and now, in 1950, we have an ingot capacity of nearly 100 million net tons per year, to be exact 99,392,800.

This expansion of steelmaking capacity brought with it not only the many problems of vast increases in physical facilities, but also the tremendous task of financing. The fact that in 90 years our annual steel capacity has grown to 100 million net tons speaks well of the men who fathered our industry, as well as the system of free enterprise that encouraged its growth.

You men of the armed forces, who in World War II had to increase the size of your units many times over, can appreciate the difficulties that the steel industry faced when its facilities experienced such a tremendous growth.

While we have been discussing steel reaching the 100 million net ton mark in 1950, it is particularly interesting to note that, since 1900, three types of steel have experienced a phenomenal growth and two have declined. The three that have grown are open hearth, alloy, and electric steels; those that have declined are Bessemer and crucible steels. It is significant that the three types that have grown are made by processes which permit better quality and closer controlled specifications. Crucible steel has declined because of its high cost and inadaptability to mass production. Bessemer steel has declined because of the limited amount of the type of ore required, and, chiefly, because it became a specialty steel since the process did not have the flexibility required to meet the varied demands of chemistry and physical properties.

The production trends of these various steels can be seen from the following comparison:

PRODUCTION OF INGOTS AND STEEL FOR CASTINGS
(net tons)

YEAR	OPEN HEARTH	BESSEMER	CRUCIBLE	ALLOY**	ELECTRIC	TOTAL
1900	3,805,911	7,486,942	112,629	Not available	5,446	11,410,928
1910	18,485,050	10,542,305	136,979	(635,957)	61,975	29,226,309
1920	36,592,522	9,949,057	80,937	(1,859,527)	566,370	47,188,886
1929	54,155,235	7,977,210	7,442	(4,432,071)	1,065,603	63,205,490
1940	61,573,083	3,708,573	1,024	(4,965,887)	1,700,006	66,982,686
1944	80,363,953	5,039,923	25	(10,633,086)	4,237,699	89,641,600
1948	79,340,157	4,243,172	*	(8,481,114)	5,057,141	88,640,470

*Included with electric steel--practically nil.
**Included under open-hearth and electric furnace--memorandum only.

So here, with this general history behind us, we are in the year 1950 with approximately 100 million net tons of ingot capacity in this country. How much is that? It is over 50 percent of the ingot capacity of the world. That also was true during World War II, when America's ingot production exceeded that of our enemies plus that of all our allies. In fact my own company, Republic Steel Corporation, alone had an ingot capacity approximating that of the entire Japanese Empire at its peaks. To illustrate further, this country produces in three months as much steel as the annual production of Russia, the second largest producer; in one month as much as the annual production of France; and in one week as much as the annual production of Sweden. In fact, the increase in capacity in this country in the last 10 years has been greater than the total present steel capacity of all Great Britain, the third largest producer.

Now, how is this tonnage consumed? Bear in mind that only 74 percent of the ingot is shipped to the trade, so that an ingot capacity

of 100 million net tons means a shipping product capacity of approximately 74 million net tons. To be specific, in 1948 the 65,973,138 net tons of product were shipped and distributed as follows:

CLASSIFICATION	NET TONS	PERCENT
Jobbers, dealers, and distributors	11,405,749	17.3
Automotive	10,220,982	15.5
Construction, incl. maintenance	7,277,018	11.0
Containers	5,302,373	8.0
Rail transportation	5,225,535	7.9
Machinery, industrial equipment and tools	3,188,718	4.8
Contractors products	2,507,977	3.8
All other	20,844,786	31.7
Total	65,973,138	100.0

In what form was this steel shipped? The following table answers that question:

TYPES OF PRODUCT	NET TONS	PERCENT
Sheet and strip (hot and cold rolled)	19,743,338	29.9
Bars (hot, cold, carbon, and alloy)	11,348,062	17.2
Plates (sheared and universal)	7,000,199	10.6
Pipe and tubes	6,881,549	10.4
Wire and wire products	4,911,142	7.4
Tin and terneplate	3,952,200	6.0
Rails and accessories	2,963,803	4.5
All other	9,172,845	14.0
Total	65,973,138	100.0

Now we come to this question, where is this steel made? The reply is contained in the answers to several other questions. Where is the ore? Where is the coal? Where is the population? Where is the center of production of steel? Where is the center of consumption? (Chart 1, page 33.)

Ore.--Approximately 82 percent of the ore produced in the United States comes from the Lake Superior region, the Mesabi Range.

Coal.--Approximately 87 percent of the coal produced in the United States is mined in Pennsylvania, West Virginia, Kentucky, Ohio, Indiana, and Illinois.

Population.--Thirty-three percent of the population of the United States is in the belt between Pennsylvania and Minnesota, comprising Pennsylvania, West Virginia, Kentucky, Ohio, Michigan, Indiana, Illinois, Wisconsin, and Minnesota. In this same belt is also the geographic center of population. It is close to the Indiana-Illinois border.

Steel Production.--The geographic center of the production of steel commodities is in Ohio; and the center of consumption of each commodity, with the exception of tin plate, is also in Ohio or just across its Western boundary in Indiana.

So here we have a belt with most of the coal, most of the ore, the center of population of the United States, and the center of production and consumption of all the major steel commodities. This same area also produces 44 percent of all the Nation's manufactured products of all types. Just as the United States, with 5 percent of the world's land and only 6 percent of the world's population, produces approximately 50 percent of the steel, so this belt, comprising 15 percent of the area of the United States and 33 percent of its population, produces approximately 75 percent of its steel. Think of it! This relatively small belt, covering three-fourths of one percent of the world's land and containing about 2 percent of its population, produces nearly 40 percent of the steel output of this entire globe.

This same remarkable area, with its coal, ore, and steel plants, is covered with a network of railroads and is bounded by the great natural waterways of the Great Lakes on the north and the Ohio River on the south. It has the four distinct seasons of the year, resulting in physical invigoration and, in consequence, an energetic people. Nature has caused these great operations to be located in this relatively small area, and it would be economically disastrous to place them elsewhere.

I have dwelt for some time on this point because in the armed forces' plans and programs this physical setup must be recognized. Advocates of military protection and of the desire of the Government to distribute work over the Nation argue that these industries should be scattered across the land beyond this belt. It should be thoroughly understood, however, that such procedure would be unsound economically and could be possible only with continuous and everlasting subsidies from Washington, substantially increasing the costs of production and obviously curtailing our standard of living.

At this point we have covered the first phase of this talk, that is, a review of a few highlights of the steel industry from earliest times up to the present moment. We are now ready to discuss the second phase, and that is some of the present problems confronting the industry, particularly from the standpoint of national defense. Our problems are your problems. So, let us consider these problems, starting with the ore and following through to the finished product. That will give us a logical procedure.

Ore.--Two world wars were fought with ore from the Mesabi Range in Minnesota. The end of this great treasure is in sight. The days of

taking from center of the pits are nearly over, and now in many cases it is a matter of scraping the edges. Some companies may be able to operate there as long as 20 years, but others may well see the end in a much shorter time. You are not going to be able to fight your wars without steel, and to have steel you must have ore.

The ore to which I refer is that which is economically usable, known as merchantable. It contains approximately 50 percent or more iron in its natural state. This ore back through the ages was much leaner, approximately 25 percent iron. Natural forces acted upon this ore to concentrate it to its present 50 percent or higher iron content. However, there are billions of tons of the original 25 percent iron ore, known as taconite, still there. But here is the problem--we don't know how to use it. We haven't found a way to use it. That is a very serious problem. The Government is working on this problem and the steel industry is working on it.

There are two types of this taconite: one attracted by a magnet like a piece of steel, known as magnetic taconite; the other, the predominant type, is known as nonmagnetic. The Government and the steel companies are working feverishly on this problem of producing from these ores a usable product for our blast furnaces. The job is to concentrate the ore that is, to eliminate enough of the impurities to make it a merchantable ore of 50 percent or greater iron content. The solution to the magnetic taconite problem is in sight; but with the great tonnage of nonmagnetic taconite, the solution seems further away. After the answers are found, there remains the financial outlay. The expenditures for most of our mines were made years ago, when a dollar went a long way. But today, after we find the answer to the taconite problem, the outlay needed to develop these taconite ores to supply the whole steel industry probably would be in the neighborhood of the tremendous sum of 2 billion dollars.

In the meantime the search for ore has been carried to all parts of the world. A large ore body has been located in Canada in the Provinces of Labrador and Quebec about 350 miles north of the St. Lawrence River. This ore is to be transported by a proposed railroad to Seven Islands, at the mouth of the Moisie River near the Gulf of St. Lawrence, and then by a combination of water and rail movements to existing plants. The proposed St. Lawrence Waterway would facilitate the movements of this ore to the Great Lakes.

In addition, large bodies of ore also have been located and are being developed in Venezuela and Liberia. Other ore bodies have been found, but little developed, in Brazil. For years substantial quantities have come from Chile.

But what will be the position of this country in time of war if much of our ore must come by ocean vessel? Based on past experience with submarines, our country could be in a very precarious military position. From a national security standpoint, it is most urgent that enough of our ore mines and concentrating facilities be developed and be held available in North America to serve the entire Nation in time of war. This includes concentrating facilities, because this taconite, when we know how to use it, must be concentrated.

Ore Boats

The ore, in nearly all cases, is carried from the Lake Superior region in what are known in the steel industry as ore boats, although technically they should be called ships or vessels.

Assuming that the taconite problem will be solved and the Lake Superior region will be a large source of ore supply for many years, how about the lake boat problem? Ore boats, during the war and subsequently, have been a bottleneck. All Canadian boats possible have been used to supplement our own ore fleets. Even so, in several recent years there was grave danger of a curtailment of steel operations because of lack of floating capacity. Only because nature was kind in permitting an early opening of the navigation season was this trouble avoided for several years. However, the margin of ore was so close that only a few weeks tonnage was in the yards of our steel plants when the new season's ore arrived.

Old boats are being used that should be out of service. Here is the age picture of the Great Lakes American ore boats:

AGE	NUMBER OF BOATS	PERCENT	AVERAGE CAPACITY IN GROSS TON
0 - 5 years	1	.4	22,000
5 - 10 "	20	7.8	12,660
10 - 15 "	4	1.6	11,980
15 - 20 "	2	.8	12,000
20 years and older	230	89.4	9,650
TOTAL	257	100.0	68,290

Think of it! Practically 90 percent of our ore boats are 20 years old or older. In fact, there are eight boats between 50 and 54 years of age. How would you like to enter a new world war with this boat situation?

Soo Locks

There is another serious angle to the water transportation problem. To reach the lower lake ports, the boats from and to Lake Superior must

pass through the Soo Locks in the Straits of Sault Ste. Marie. There are five parallel locks, four American and one Canadian. Here is the serious situation: If a suicide squad should drop modern high-powered bombs on these locks, the life line of our ore supply would be severed. In consequence, the steel mills would be forced out of operation for lack of ore and the war could come to a quick and disastrous end. The problem of defending these locks is of vital importance.

What else can be done besides military protection? There is one thing that can be done. A year or more supply of ore might be stocked on this side of the Soo Locks, preferably in Ohio, because that is the center of most of this production. It should be used only in time of war in the event the locks were destroyed. This would require a gigantic financial outlay, representing approximately from half a billion to a billion dollars. In the steel industry a billion dollars is still a lot of money.

This is a problem when it is considered that the existing lake boats barely were able to carry the ore needed to sustain our high production for the past eight or nine years. Of course, when steel operations drop off, there should be an excess floating capacity to carry ore to a stockpile. Otherwise, at peak operations foreign ore would probably have to be used, so that enough of our domestic ore could be available for this stockpile immediately.

Other measures to assure a supply of ore in case of an emergency at the Soo Locks are:

1. Complete the installation of the enlarged modern docks at Escanaba, Michigan, which were started during World War II but never finished. This should be done immediately. In case of a national emergency, ore could be brought over to Escanaba and then shipped from there to the lower lake ports. In World War II a great enlargement was undertaken there, but it was never completed. I think there is no question that, if we want to be prepared for the next war, those docks at Escanaba should be completed now.

2. Another thing we can do in case the locks are bombed is to ship the ore tonnages, beyond the capacity of the boats from Escanaba, direct by rail to Chicago as well as through Chicago to points east.

3. To avoid congestion in the Chicago area, ship part of the ore for the eastern plants, if necessary, by rail to the western coast of Lake Michigan, then across the lake by car ferries, and finally by rail to the eastern plants. Obviously, the car-ferry system would have to be expanded and the various rail routes strengthened.

These measures might be followed in place of a stockpile, but it probably would be wise to do all these things. These considerations are long-time projects, and, therefore, it is urgent that a decision be made and steps taken immediately.

When one considers how dependent we are upon the Soo Locks in the immediate future and probably for a long time to come, I personally feel that these locks are as vital to the country as the Panama Canal. Their defense and the guarantee of an ore supply are matters of the highest importance and the gravest concern.

Blast Furnaces

Now, to take the next step in the process of iron and steel making, we come to the units that use the ore, namely, the blast furnaces.

The blast furnaces have been modernized year after year, until today we have many large furnaces. That is evidenced by the fact that, even though our pig iron production has been constantly increasing, the number of furnaces has been on the decline, as per the following tabulation:

YEAR	NET TONS PRODUCED PIG IRON and FERRO ALLOYS	PERCENT CAPACITY OPERATED	NUMBER OF BLAST FURNACES AS OF 1 JANUARY	AVERAGE SIZE OF BLAST FURNACES N. T./DAY
1901	17,783,756	69	406	181
1910	30,579,995	72	468	261
1920	41,357,105	74	453	355
1930	35,562,429	62	316	523
1940	47,398,529	85	232	686
1948	61,911,559	92	239	806
1949	54,206,343	77	246	819

You can see from that table how the tonnage of iron has tripled, but the number of furnaces has dropped since 1901 from 468 to 246. The answer is that the size of the furnaces has been going up. The size has gone from an average of 181 tons in 1901 to 819 in 1949.

Blast furnaces have a high thermal efficiency; they are economical and simple. They should not present a problem so long as the trend of modernization is continued.

Coke Ovens

In addition to ore, one of the important ingredients of our blast furnaces is coke.

As for the coke ovens in the steel industry, many are old and are deteriorating; but this is a situation which probably will be properly handled if time does not run out too soon. The first by-product coke oven was installed in this country in 1892 and a large number in the World War I decade. When these ovens were erected, it was expected that their life would be around 15 to 20 years. This put many of them beyond their expected life during World War II and the postwar period. So, during the high operations of the 1940's, when production was important, we found in many instances reduced operations per oven with attendant increased operating costs, loss of valuable by-products, and very excessive maintenance bills, accompanied by the need of making up the resultant shortage by using inferior and much more costly beehive coke.

The coke oven trend can be seen from the following tabulation, showing a summary of by-product coke ovens of iron and steel plants in the United States as of 1 January 1950:

AGE OF OVENS YEARS	NUMBER OF OVENS	PERCENT OF OVENS	CARBONIZING CAPACITY IN N.T./YR.	PERCENT OF CAPACITY
under 5	2105	16.6	16,531,000	17.9
5 - 10	2569	20.2	19,705,000	21.4
10 - 15	1124	8.9	9,162,000	10.0
15 - 20	359	2.9	2,632,000	2.9
20 - 25	1295	10.2	10,987,000	11.8
25 & older	5238	41.2	33,177,000	36.0
TOTAL	12,690	100.0	92,194,000	100.0

You will note the upsurge of coke ovens built in the last 10 years. However, 51 percent of the ovens are beyond their expected life of 20 years. Obviously, this country is facing a huge coke oven replacement campaign in the 1950's. Should a world war be imminent, a program of coke oven building should be given serious consideration immediately.

Open Hearth and Steel-Making Problems

Now, in going down this process from the ore to the coke ovens to the blast furnaces, we come next to the open hearths. The open hearth is the heart of the steel plant.

Open hearth steel ordinarily is made from a mixture of steel scrap and pig iron from the blast furnace. Steel, of course, could be produced in these furnaces with a 100 percent iron charge, as is now

done in the duplex process. However, inasmuch as most of our open hearth steel actually is made from the scrap and iron mix, it stands to reason that a 100 percent iron charge would force us to more than double the output of ore, coal, and limestone, and with it coke works and blast furnaces. This 100 percent iron mix has not been used, because of the iron units in the scrap made available each year throughout the country. In other words, the use of scrap to make steel in our open hearth furnaces constitutes a salvage operation which normally is more economical than the all pig iron process, and which, above all, conserves our national resources. So, in the majority of cases our steel industry is built around the use of scrap in our open hearth furnaces; hence, scrap becomes a very vital raw material.

Therefore, let us look at the scrap picture. Scrap comes from three main sources:

1. Home scrap--that generated in the steel plant.--Since only 74 percent of the steel in the ingot is shipped, the remainder stays in the plant, and most of it is in a form to remelt in the open hearth furnaces. Scrap so produced theoretically never leaves the plant, and, in consequence, is known as "circulating scrap." It represents approximately 63 percent of the scrap charged.

2. Fabricators' scrap.--About 11 percent of the purchased steel is returned to the steel plants as scrap and becomes 18 percent of the scrap charged.

3. Steel of the Past.--This is obsolete facilities, like discarded machinery, wrecked buildings, old cars, and so on, and becomes 19 percent of the scrap charged.

	POUNDS OF MATERIAL CHARGED PER N.T. INGOTS	PERCENT OF TOTAL CHARGE EXCL. ALLOYS	SOURCES OF SCRAP CHARGED PERCENT
SCRAP:			
Home scrap	582	26	63
Fabricators scrap	163	7	18
Steel of the past	180	8	19
Total scrap	925	41	100
Hot iron and cold iron	1136	51	
Iron scrap	87	4	
Total iron	1223	55	
Ore, and sinter, etc.	92	4	
Total metallic charge excluding alloy additions	2240	100	

The preceding table indicates the relationship of the various metallic materials charged in the open hearth. It is a composite figure for all the open hearth furnaces in the United States in the year 1940, which can be considered a representative year.

You will note that "steel of the past" is of significant magnitude, since it accounts for 19 percent of the scrap charged in the open hearth furnaces. Consequently, when steel is exported as war material to be destroyed or left on foreign soil, or when great tonnages of steel and steel products are sent to the bottom of the ocean, a scrap shortage eventually develops that is of serious consequence. The scrap available in war periods is further reduced by the necessity of operating plants and equipment past the point where they normally would be scrapped.

Now, of course, we could make more blast furnace iron; but this source is limited by the available blast furnaces, as well as the amount of iron ore that can be transported to the plants. It would mean more furnaces, so it gets back to our furnace situation. It also gets back to our coke oven situation and our ore mine output.

So here comes a question. You say, "Well, what can we do about it?" One thing you can do—and the steel industry has pleaded for this from before Pearl Harbor—is this: Don't ship our scrap out of the country. Don't ship it at any time.

Now, are there any other steelmaking problems? Yes, there are—nonferrous metals. While iron is the basic metal in steelmaking, there are 12 very important nonferrous metals used by the steel industry which, in alphabetical order, are aluminum, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, tin, tungsten, vanadium, and zinc. Of these 12 metals only two, aluminum and molybdenum, can meet the requirements of the steel industry from mines within the borders of the United States. The other 10 must be supplemented, in part or almost entirely, by foreign supply. Five of these elements, manganese, nickel, chromium, tin, and cobalt, must come almost entirely from a foreign source. They are very important metals in times of peace and even more so in times of war. Their function in the steel industry is as follows:

Manganese

As stated earlier in this talk, Sir Henry Bessemer was not able to produce a commercial steel until Mushet, in 1856, introduced manganese into the metal. Without manganese the sulphur in the steel forms fusible compounds of low melting point, which cause the steel to disintegrate during heating and rolling. The introduction of manganese forms compounds of higher melting point, which are so dispersed in the steel that it can be heated and rolled to a commercially satisfactory product. Hence, manganese is very

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vital to the making of all types of steel. It also is used, in larger percentages, to improve the physical properties of steel.

Except for a deposit in Montana, only low-grade manganese is available in our country. Not until recently have methods been evolved to extract manganese from some of the domestic ores. Even so, the cost of manganese so extracted, except from the Montana deposits, would be far above that brought from abroad.

The solution to this manganese problem is to have a huge stockpile of usable manganese ore, or to have plants built for wartime operation which can extract it from our low-grade domestic ores, or both.

Nickel

Nickel comes mostly from Canada. During the war, Canada could not meet our needs. Mines could not be opened rapidly enough and refining equipment could not be installed in time. This led to the tri-alloys, which will be discussed later. The richness of nickel ore has declined considerabl

During World War II an extraction plant also was erected in Cuba to reduce a body of ore which was contaminated with small amounts of nickel and chromium. Today it is standing idle because it is uneconomical to operate.

We again will probably face a nickel shortage in case of war.

Chromium

Chromium is used in stainless steel, as well as heat-resistant, acid-resistant, and other high-grade alloys. It is also an important ingredient in jet aircraft applications.

Tin

Tin comes from the East Indies and from Bolivia. Most of it and the best quality comes from the East Indies. During World War II, Bolivian production was stepped up, and at the same time some was used from stockpiles. Electrolytic lines also were developed and installed which, through electrolytic deposition of the tin, made a more uniform coating, and gave the desired protection with a smaller consumption per square foot of surface.

Cobalt

The quantity used of this element is small, but still important. It is used in the making of such articles as cutting tools and permanent magnets.

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It should be thoroughly appreciated that, unless nonferrous metals are available, we could make few, if any, of our war steels; without them, much of our steelmaking capacity would be useless. Therefore, it is imperative, in the interest of national security, that adequate quantities of these essential nonferrous metals be available to the steel industry in time of war. One aid in conserving these nonferrous metals in World War II was the development of national emergency steels, consisting of tri-alloys of chromium, nickel, and molybdenum. Since the war these national emergency steels have been standardized and are still being used.

While we are still considering steelmaking problems, let us take a look at standard steels. Many people look upon steel as a single standard commodity much like a standard automobile model. Actually, steel is ordered by chemical analysis, by size, by cross section, by shape, by internal structure, and by surface finish. These factors can produce millions of combinations. The acreage, the buildings, and the money required to make and store these millions of combinations for immediate shipment would run into fantastic figures. So, for all practical purposes, steel can be considered a custom-made product rolled against specific orders.

To reduce the number of steels to a reasonable figure, standard specifications have been developed. The two most widely recognized standards are the ASTM and the AISI. The ASTM, or American Society for Testing Materials standards, apply mainly to steels used for structural purposes and are based on physical properties or quality factors other than chemical. The AISI, or American Iron and Steel Institute standards, are based entirely on chemical composition. They were adopted during World War II and were the outgrowth of a numerical system for indicating chemistry originated in 1911 by the Society of Automotive Engineers; they were called SAE steels. The AISI standards are applicable only to semifinished and bar products, as most of the other products, such as strip, pipe, and wire, often are ordered to do a specific job without specifying the chemical analysis.

It should be remembered that most steel orders call for less than 20 tons per item, and few are large enough to make one heat in an open hearth furnace. Thus the steel companies must combine orders to get enough tonnage of the same analysis to make a heat of 100 to 200 net tons. With many different analyses, this presents a difficult situation to say the least. Consequently, by having a series of standard analyses developed, the companies have been able to use their furnaces more effectively. Furthermore, this procedure is in line with the standardization policy sponsored for years by the Bureau of Standards, and employed by the automobile and other industries.

2000

A tabulation of these nonferrous metals, together with an explanation of their uses, application, and source of supply, is given below, as published in the February 1947 issue of "Steel Facts."

Principal Non-Ferrous Metals Used By Steel Industry

Metal	Reason for Use	Typical applications	PREWAR AVERAGE			WARTIME AVERAGE		
			% of World production produced in U. S.	% of World production consumed in U. S.	Chief Sources of United States Supply	% of World production produced in U. S.	% of World production consumed in U. S.	Chief Sources of U. S. Supply
Aluminum	Removes gases and impurities; aids surface hardness	Seldom more than a trace remains, except in nitrided steel	30	40	United States	35	35	United States
Chromium	Small amounts improve hardening qualities; more than 10% prevents rust	Tools; machinery parts; stainless and heat- and acid-resisting steels	Insignificant	35	Africa, Cuba, Greece, New Caledonia, Oceania	5	50	Africa, Cuba, Greece, New Caledonia, Oceania
Cobalt	Holds cutting edge at high temperatures. Improves electrical qualities	High-speed cutting tools; permanent magnet steel	None	10	Canada, Belgian Africa, Australia	Insignificant	50	Canada, Belgian Africa, Fr. Morocco
Copper	Retards rust	Roofing and siding sheets, plates	40	35	United States	40	60	United States, Chile
Lead	When mixed with tin, forms a rust-resisting coating for steel. Small amounts alloyed with steel improve machinability	Sheet steel for roofing, auto gasoline tanks, etc.; machinery parts	30	35	United States	27	50	United States, Mexico, Australia, Canada, Peru
Manganese	Small amounts remove gases from steel; 1 to 2% increases strength and toughness; 12% imparts great toughness and resistance to abrasion	Small amounts present in all steels; 1 to 2% used in rails; 12% or more for frogs and switches and dredge bucket teeth	Insignificant	20	Russia, Gold Coast, Brazil, India	5	30	Gold Coast, Brazil, India, Cuba
Molybdenum	Increases strength, ductility, and resistance to shock	Tools; machinery parts; tubing for airplane fuselage	80	40	United States	90	75	United States
Nickel	Increases toughness, stiffness, strength, and ductility. In large amounts resists heat and acids	Tools; machinery parts; stainless steels; heat- and acid-resisting steels	Insignificant	50	Canada, Norway, New Caledonia	Insignificant	75	Canada, Cuba, New Caledonia
Tin	Forms corrosion-resisting coating on steel	Sanitary cans; kitchenware	Insignificant	45	British Malaya, United Kingdom, Netherlands India	Insignificant	45	Bolivia, Belgian Congo
Tungsten	Retains hardness and toughness at high temperature	High-speed cutting tools; magnets	10	20	China, British Malaya, United States	25	40	United States, Bolivia, China, Argentina, Brazil
Vanadium	Increases strength, ductility, and resiliency	Tools; springs; machinery parts	15	25	United States, Peru, Rhodesia	50	75	United States, Peru, South West Africa
Zinc	Forms corrosion-resisting coating on steel	Galvanized roofing and siding sheets; wire fence; pails, etc.	35	35	United States	40	50	United States, Mexico, Canada, Peru, Australia

Rolling Mills

Of necessity, I have devoted quite an appreciable part of my allotted time to the open hearth department and steelmaking problems. Now, let us look at the next step, that is, the rolling mills and the subsequent finishing operations.

Generally speaking, these units, as now standing, will make the war steels. Of course, some changes may be necessary. Take, for example, some situations during World War II. Between World War I and World War II the continuous strip mill was developed. Until World War II, plate mills rolled the plates used to construct our seagoing vessels. Before World War II had gone very far, it soon became evident that our plate mill capacity was far less than that needed to meet the schedule required to provide the many additional ships needed as well as to offset the sinking by submarines. So the strip mills, originally intended for only sheets and strip, were called upon. But these mills had been designed to finish products up to a maximum of one-fourth inch, while the shipbuilding program called for plates mostly over one-fourth inch to one and one-half inches. Consequently, to meet this emergency, steel companies equipped their strip mills to furnish such plates. I am proud to say that Republic was the first to do this job. Other steel companies followed suit. Without this conversion of the modern strip mills, our shipbuilding program would have been a failure and probably the submarine warfare would have been a success.

Another step, somewhat revolutionary, was to provide facilities to roll gun blooms, which displaced much of the forging operations and therefore greatly accelerated the production of guns.

In case of another war some steps like these will probably be needed; but basically the rolling mills and finishing equipment, as they now stand, should be able to produce the steels of war.

To digress a moment, let me say that any reference to the Republic Steel Corporation in this lecture is not intended to imply that other companies have not also made great and significant contributions. I am more familiar with Republic and so the few examples I take from Republic are to be considered merely as representative of what was done in the steel industry as a whole.

Steel Capacity

Then we come to the final questions. Is there enough steel capacity for wartime, and is the steel industry building new plants and facilities to keep up with peacetime needs and, in case of war, wartime needs?

First of all, there is not enough steel capacity for war if peacetime production is continued. In fact, there will not be enough manpower in the manufacturing plants of the Nation to make the normal peacetime products as well as material for the armed forces. Briefly, in time of war, peacetime products must be cut out almost entirely and promptly. Then there should be adequate steel capacity for our war machine.

As to building new capacity, I have pointed out earlier in my talk that with a steel production of 13,259 tons in 1860, the steel industry has doubled its steelmaking capacity every few years until here in 1950 it has a capacity of just a little short of 100 million net tons. Looking at it another way, the steel industry has grown much more rapidly than the population. This can be seen by the following per capita production of steel:

YEAR	POUNDS OF STEEL STEEL CAPACITY	PER CAPITA PRODUCTION	PERCENT OF OPERATIONS
1890	242	152	63
1900	561	300	53
1910	877	636	73
1920	1,179	893	76
1930	1,189	743	62
1940	1,240	1,017	82
1948	1,290	1,213	94
1950	1,343		

This table shows that in the last 60 years steel capacity has increased over fivefold faster than the population. In other words, steel capacity was 242 pounds per person in 1890 and it is 1,343 pounds per person in 1950. That is over fivefold.

Furthermore, it is interesting to note that from the beginning of the steel industry we have records of only seven years when the rate of operations exceeded 90 percent of its capacity, with the peak being 98.1 percent in 1943, the middle of World War II. Does this not bear out the contention of the steel industry that it is keeping pace with the steel trend demands of the Nation?

Economic Problems

Chart 2, page 35.--While we are discussing steel expansion, let us consider construction costs. New plants completely integrated from raw material to finished product probably will cost from $250 to $300 per net ton of annual ingot capacity, compared to the present investment of $60 a ton. Interest, depreciation, taxes, and insurance for new plants of

this type will total from 8 to 12 percent. If we use only 8 percent and only $250 per net ton, the fixed charges would be $20 per net ton of annual ingot capacity. Existing plants carry fixed charges of only $4.80 per net ton (8 percent of $60). In other words, if these plants were replaced at present costs, they would carry an extra burden of $20 less $4.80, or $15.20 per net ton.

What does this mean? Let us consider the boom years from 1940 to 1948, inclusive. In that period the steel industry made, before income taxes, a profit of $7.66 per net ton of ingots. This profit would cover only part of the additional fixed charges on a new plant and leave it in the red to the sum of $7.54 per net ton ($15.20 less $7.66) or a loss of over one-half billion dollars per year. In other words, at today's costs and today's steel prices, the steel industry cannot afford to build new plants unless there is a very outstanding advantage of location to raw materials in one particular spot to markets. Think of it! This great American steel industry, with one-half the ingot capacity of the world and the backbone of our war machine, would go in the red by over half a billion dollars per year at full operations at the peak of prosperity if at present steel prices and present construction costs it replaced its existing facilities just as they now stand.

Sometimes the question is asked: Regardless of these construction costs, do not the steel companies make millions which can be used to build plants? This seems like a logical question, particularly so because the Government, whenever it wants to make a drive on prices or costs or some other economic question, usually brings the steel industry to the public "whipping post" and applies the lash. Years ago the railroads and then the meat packers were brought to the "whipping post" and lashed and regulated, with many companies in both industries eventually going into receivership; the steel industry is now getting this treatment.

So I think a discussion such as this would not be complete without some reference to the profit picture. For this purpose, the following table, showing the earnings on the net worth (net earnings divided by the sum of all capital stock and surplus), based on data published by the National City Bank of New York, is presented.

You can see, over the 11-year period from 1938 to 1948, inclusive, that the steel industry stands far down the line. It also should be noted, in this 11-year period, that of the 34 classifications of business, all showed better profits than the steel industry 83 percent of the time. Even in 1948, which was considered a very good year for the iron and steel industry, there were 22 industries that exceeded its return on the net worth.

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NET EARNINGS--PERCENT RETURN BASED ON NET WORTH
IRON & STEEL INDUSTRY VS OTHER INDUSTRIES

	PERCENT 1948	Relative ranking 1938 to 1948 incl. NUMBER OF YEARS ABOVE STEEL	BELOW STEEL	EVEN
Household equipment	27.8	11	0	0
Textiles	27.3	9	1	1
Office equipment	25.6	11	0	0
Wood products	25.5	11	0	0
Automobiles and equipment	25.4	10	1	0
Beverages	23.7	11	0	0
Petroleum products	22.1	10	1	0
Building equipment	21.0	11	0	0
Electrical equipment	20.5	11	0	0
Mining and quarrying	20.5	9	2	0
Paper products	20.4	11	0	0
Machinery	19.3	11	0	0
Chemical products	17.7	11	0	0
Stone, clay and glass	17.5	11	0	0
Printing and publishing	17.4	9	2	0
Hardware and tools	17.1	11	0	0
Misc. manufacturing	16.3	11	0	0
Misc. metal products	15.7	11	0	0
Agricultural implements	14.8	8	2	1
Leather products	14.5	10	1	0
Food products	14.4	10	1	0
Tobacco products	14.3	11	0	0
Iron and steel	14.0	-	-	-
Rubber products	14.0	10	0	1
Clothing and apparel	13.8	9	1	1
Service and construction	10.5	8	3	0
Railway equipment	10.2	7	3	1
Finance	8.5	6	4	1
Public utilities	8.4	6	5	0
Shipping	7.6	8	3	0
Class I railroads	5.4	3	7	1
Traction and bus	4.8	1	9	1
Misc. transportation	4.7	7	4	0
Aircraft and parts	3.1	8	3	0
Total		302	53	8
Percent		83	15	2

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In regard to profit, let me state this: The steel industry, to operate, must earn a profit. Then it can return a reasonable amount to the people who have invested their savings in it, and then also have some money left to put back into the business. The history of the steel industry, as well as of other industries, shows that companies which do not keep improving their facilities and processes eventually fall by the wayside, because they cannot make the product as good or as cheap as their competitors. This is a ruthless fact which keeps our industrial system dynamic and steadily moving forward.

We now have reviewed the problems of the steel industry from the mines to the finished product; but there is yet one important element in this picture that also should be considered--that is the men who make the steel. These men are experts in their own line, who have devoted their life to learning and solving problems in their complex industry. You men of the armed forces should feel free to call on their know-how. Cooperation between the armed forces and the steel industry in the past has resulted in important developments, and serves as a fine example of teamwork and exchange of information. As long as we combine that fine cooperation with an understanding and a mutual respect for each other's problems, the armed forces and the steel industry should continue as an invincible team.

With that statement I am concluding this lecture. In closing I would like to restate briefly some of the problems facing the steel industry, particularly from the standpoint of national defense:

Growth

The steel industry did not begin its real growth until after the Civil War. Then it doubled its output every few years, going from 13,259 net tons in 1860 to a capacity of approximately 100 million net tons in 1950. It grew many times faster than the population.

Ore

Our present ore bodies are being depleted rapidly. An adequate supply of ore must be assured. Foreign ore should be brought in. Labrador and the St. Lawrence Waterway should be developed. Particularly, we must develop our taconite ores in the Lake Superior region so that our country can be dependent wholly on its own ore resources in time of war.

Ore Boats

The supply is very tight. Ninety percent of our present ore boats are over 20 years old. An adequate number of ore boats in good condition must be available.

Soo Locks

The destruction of these locks could lose a war. They must be thoroughly protected and ore must be made available in case they should be destroyed.

Nonferrous Metals

Most nonferrous metals used in the steel industry come from foreign sources. An assured supply of them is very important.

Coke Ovens

Over half of the coke ovens in this country are now beyond their expected life. If an emergency is imminent, an accelerated replacement program should be undertaken.

Scrap

Scrap exportations should be prohibited. Scrap is just as vital a source of iron units as the ore mines.

Steel Specifications

Types of steel should be kept to a minimum. Complex steels should be avoided whenever possible.

Earnings

The steel industry must be allowed to earn enough money to stay modern and keep growing to be in a position to do an effective job if a national emergency arises.

This is our land, yours and mine. We do not want war; but if outside forces make it necessary to defend our land and to preserve the institutions handed down to us by our forefathers, let me assure each one of you that, should the clarion call sound, the steel industry is ready to stand shoulder to shoulder with the armed forces to answer that call.

QUESTION: I gather that the construction of ore boats is one thing that you would like to pursue. I understand also that the shipyard people are badly in need of business. Why aren't more ore boats being built at the present time?

MR. RICHARDS: There are two reasons. One is that, although we have kept up with the requirements, the steel situation is tight. The second is that, unless you can show a return on the investment, you can't get the capital. So we just can't afford to build steel plants today and we can't afford to build ore boats. There has been only one ore boat built in the last five years.

QUESTION: In your opinion will the importation of this Canadian and Venezuelan ore retard the research and development on a process for extracting the iron from taconite.

MR. RICHARDS: No, I don't think so, because the Bureau of Mines is working actively on it, and much of the entire steel industry is financing a development of it at Battelle Institute and elsewhere.

U. S. Steel--and this is known, so I am not talking off the record--in addition to their Venezuelan operation, has a large laboratory in Duluth, where it is working on taconite. That company is also erecting a plant up on its mines to do it.

We are all very actively working on it, because we use in the neighborhood of 80 or 90 million tons of ore a year; and even with this Venezuelan ore coming in, the Chilean ore coming in, and so forth, we are still not going to have enough. The Labrador ore I spoke of won't produce more than 10 million tons a year, and what is 10 million tons out of 90 million? We need all these sources.

The answer to your question is, "No"; it will not retard our research and development on the taconite process.

QUESTION: In "Time" magazine in the latter part of February an article was published regarding the turbohearth method of making steel. Would you comment on that and indicate when it may be in operation? Or has it developed that far?

MR. RICHARDS: I would have to answer that by saying that it is being developed by companies other than my own. When I asked them, they said; "We will have quite a lot of headaches yet before we can get it operating."

It is an ingenious idea. It should help production. The basic idea is just like that in the Bessemer process. You blow it with air. In the Bessemer process it takes 15 minutes to blow the air through, and you convert the iron into steel. In the open hearth it takes from 10 to 12 hours. The idea of the turbohearth is to incorporate both those ideas and get the quick reduction of the Bessemer and the finishing effect of the open hearth.

I think that is going to have a place in the industry, but I do not believe it will be commercial for some time. What its final economic effect will be I can't tell you.

QUESTION: You brought out the fact that the profits of steel now are only about half the amount required to amortize plant replacement at the current index. I wonder if you would develop that a little further as to what are the principal contributing factors to that condition. As I see it, one of the components of plant construction would be steel; and if there were an increase in the price of steel to increase your profits, that would immediately increase the cost of your construction.

MR. RICHARDS: That is right.

QUESTION: Your other components, such as labor costs, taxes, and so forth, hit you two ways. They keep your profits down on the one side and keep construction costs up on the other. I would like to know the comparative importance as contributing factors to this condition.

MR. RICHARDS: I will try to answer that. If I don't answer it right, you come back at me. The answer, as I see it, is this:

First let us say that construction costs are high. That gets back to what this gentlemen said about the mills. It is even worse in the construction industry. The productivity of the construction workers is not high.

I think the chief thing, though, is the matter of prices. We get severely criticized about our prices going up. I just talked about the whipping post. Our prices on steel have not gone up near as much as those of other commodities. While an increase in the price of steel would increase the cost of construction of a new plant somewhat, it takes only about a fourth as much steel to construct a new plant as you would get out of it annually. As a rule of thumb I would say that for an annual capacity of 10 million tons it would take about 2.5 million tons to construct it. So that is not the chief thing. Steel is not being priced high enough in spite of what you read in the papers. That is the basic trouble.

What were the other factors you asked me about?

QUESTION: How about corporate taxes as a barrier to plowing money back into plant modernization.

MR. RICHARDS: Yes. That is very true. Our corporate taxes today amount to about 38 percent. Of course, if we could plow part of that money back instead of paying it out as taxes, it would be very helpful. It is quite a sizable figure when you look at what the taxes amount to. The Government is getting a big chunk of our earnings.

But you have to face this situation as it exists. I don't think you are going to see construction prices go down a great deal. You can look over the list of construction costs and see what I mean. They have been high and they are going to be higher. In depressions they may reduce some, but eventually back they come to that line. I just say we are not getting enough money for our steel. You take the other 34 industries in that table. You seldom hear anything said when their prices go up. But let our prices go up and we have half the industry down here in Washington getting raked over the coals.

QUESTION: I have seen figures from time to time which indicate that the steel industry is operating at greater than 100 percent of capacity. What is the basis of such figures?

MR. RICHARDS: I will tell you how that happens. We figure the operations based on those of our open hearths. We always have more finishing operations than open hearth. You have to make the steel before you can fabricate it. So we figure our percentage of operations on our open hearths.

Now, what happens in the open hearth is a chemical reaction. We can control it up to a certain point, but God Almighty has most to say about how fast it is going to take place. The figures that you see are an average based on certain conditions of the metals and other materials that go into the open hearth operations.

Another factor that comes in is the matter of rebuild. A furnace, after what we call two hundred heats, which would be about 100 days or something less or more, has to be taken down for rebuilding. That rebuild will take that furnace out of operation for four or five days or even as much as a month. So we figure on the average rebuild time. Once in a while you get a period where you are off the average. It is like a game of cards; once in a while you get a good hand. Once in a while we have more furnaces in operation than usual.

Then again the weather and tradition come into it. You will always find that March is a good month in the steel industry. When you are thinking of output for the steel industry, the steel man's month is March. If he wants a record, if he wants anything, he goes after it in March. In addition, in our particular plant we base our vacation pay on the earnings in March, and you ought to see the boys go after it.

QUESTION: I get the distinct impression from all you have said that you think it is inevitable that steel prices will have to rise in the long run. Would you care to comment on that and indicate whether or not you can see any possibilities, such as technological developments, that might offset a rise in steel prices.

MR. RICHARDS: I know of nothing definite about steel prices going up now. All I can say is that, if the present prices of other things keep up and if present costs keep up, and if the steel industry is going to continue to develop in any degree comparable to the way it has been developing--7,000 percent since the Civil War--we will have to have more plants eventually, and we can't get them unless the price of steel goes up. But I know of nothing in the picture that would suggest it is going to happen right now.

QUESTION: I am assuming that the steel industry will continue to expand. If it does continue to expand and the prices of construction materials continue at their present level, how can it be otherwise than that the price of steel will go up?

MR. RICHARDS: Construction cost must go down or steel prices have to go up. Otherwise who is going to put money into a business to build a new plant if they can't get their money back?

You hear rumors about plants being erected all over the country. There is only one such rumor of plants that the steel corporations are going to build that you can put any credence in, and that is the one on the east coast. I have no authority to say this, and I don't know the real reason why they can afford to build that plant, except that it is going to be in a very concentrated market, for one thing; and, for another, they are going to bring in this Venezuelan ore, which is very, very fine ore. There is not going to be any rail haul of ore to that plant. They are going to get it right along the seacoast. That might make it possible to build a plant in that location; but, basically speaking, building new plants is not in the cards.

I see a number of appropriations being made, and, as I say, we will keep the industry going somehow. We have done it in the past and we are going to do it again. These things will be worked out somehow. But many appropriations get kicked out these days because when a company see the cost of the equipment and then figures its return on the investment, it decides that it can't afford to build. Of course, that is also probably true of a lot of other industries right now.

QUESTION: Sir, quite aside from the desirability of increasing your total ore-carrying capacity, I just don't understand why these ore boats that you speak of ought to be replaced. It seems that they are

doing the job now. As long as the companies are in the black in spite of increasing maintenance costs on those boats, it is economical to run them, more economical than to replace them. When the maintenance costs on these boats get up to a point where they put the companies in the red and threaten to put them out of business, the boats will be scrapped and replaced by others. I daresay that the law of supply and demand will bring that about. Therefore it seems to me we ought to adjust our ideas on how long these ships ought to last. Perhaps instead of saying they ought to last 20 years, we ought to say they should last 40 years.

MR. RICHARDS: Captain, I am not going to argue with the Navy, because you know more about those things than I do. But I do want to say this--word reached me a few days ago that five ore boats have just been ordered out of service because they are too old. Those boats are operating, but they will have to be taken out nevertheless.

I agree with you that the age of the boat is not the only criterion. A boat might be 100 years old; but, if it is maintained and certain things about it are satisfactory, it should be able to run. But our ore boat situation is very tight. A lot of the boats are old. If anything, they ought to be added to. All I have tried to point out is what problems we will have if we should go to war, and our ore boats will be one of the problems.

QUESTION: I would like to ask about your theory that steel prices will have to go up. Undoubtedly you have your reasons for thinking so, and you are closer to the situation than we are. But do you think that everything must forever be going up, or do you think some day people will come to their senses and level off?

MR. RICHARDS: That is an economic question. Personally, I would rather see prices go down. I think we would all be better off if they should go down.

Let us just take insurance as an example. I guess you all have life insurance. I have been trying to buy what I could over a number of years. I look at some of the policies that I bought 20 or 30 years ago and I try to figure out what my wife is going to be able to do with that money. It doesn't look like the same picture at all any more. As prices go up, I think it hurts everything like that.

I personally feel, and I think everybody else does, that if we could hold everything in balance, it would be a lot better. But everything would have to go down, both wages and prices. That would certainly protect your investment and your savings better than to have things always going up.

QUESTION: Is there any chance, in your opinion, of things going down?

MR. RICHARDS: Well, all I have to say about that is this—we have had a period of prosperity now for eight, nine, or ten years; that can't keep up forever. That is the longest prosperity period we have ever had, going back to the Revolutionary War. We are going to get softer periods sometime; there is no question about that. You don't have to be an economist or a prophet to say that. That is just common sense. When that happens, prices usually come down.

We had a depression not so very long ago when prices went down, and wages and salaries went down with them. If we should hit another period of depression and prices tend to go down, it will make a difficult situation if the rate of pay stays up.

So I think there will be a tendency for prices to come down at some time in the future. What they will do over the long-time trend I don't know. You generally have one of these hills and valleys affairs. The trend now has been for a long time upward. I think that is bad. I think it is bad for the trend to keep going up. But what are you going to do? You have to keep everything in balance.

QUESTION: You have answered most of my questions pertaining to the mobilization planning by the steel industry and have enumerated all your problems. I am wondering whether, in addition to that, there is anything that the Government could do that would assure the effective and timely utilization of the steel industry for war production. Would you cover that side?

MR. RICHARDS: I have pointed out several problems where you could help. I have mentioned the Soo Locks. I have talked about stockpiling. Things like that you men could do.

Further than that, the armed forces have committees that contact the industry from time to time. I know they come to our plant and talk to our metallurgists. I think that is certainly fine, because we see your problems and you see ours. I think the more you do of that the better

QUESTION: Are there any foreseeable government regulations that would be necessary to make the mobilization effective, controls or that sort of thing, which should be prepared now? And do you think that is necessary?

MR. RICHARDS: I do think you ought to have your plans all ready so you know what we are going to do in case there is a war. I think plans like what plants are going to operate and what are not should be worked out pretty carefully in advance. We ought to do that promptly. Things like the Controlled Materials Plan, that we had at the end of the last war, could be worked out.

We had some bad situations the last time that could be avoided by planning in advance. For instance, we would be told in April that there is a job that would have to be shipped by the first of September, and then we would find out that the equipment we needed to do that job wouldn't arrive until the following year. Things like that made it tough. You can plan to avoid situations like that. There are a lot of things that can be done on that kind of planning.

I think we made great improvements as the war went on. We learned how to do that job better.

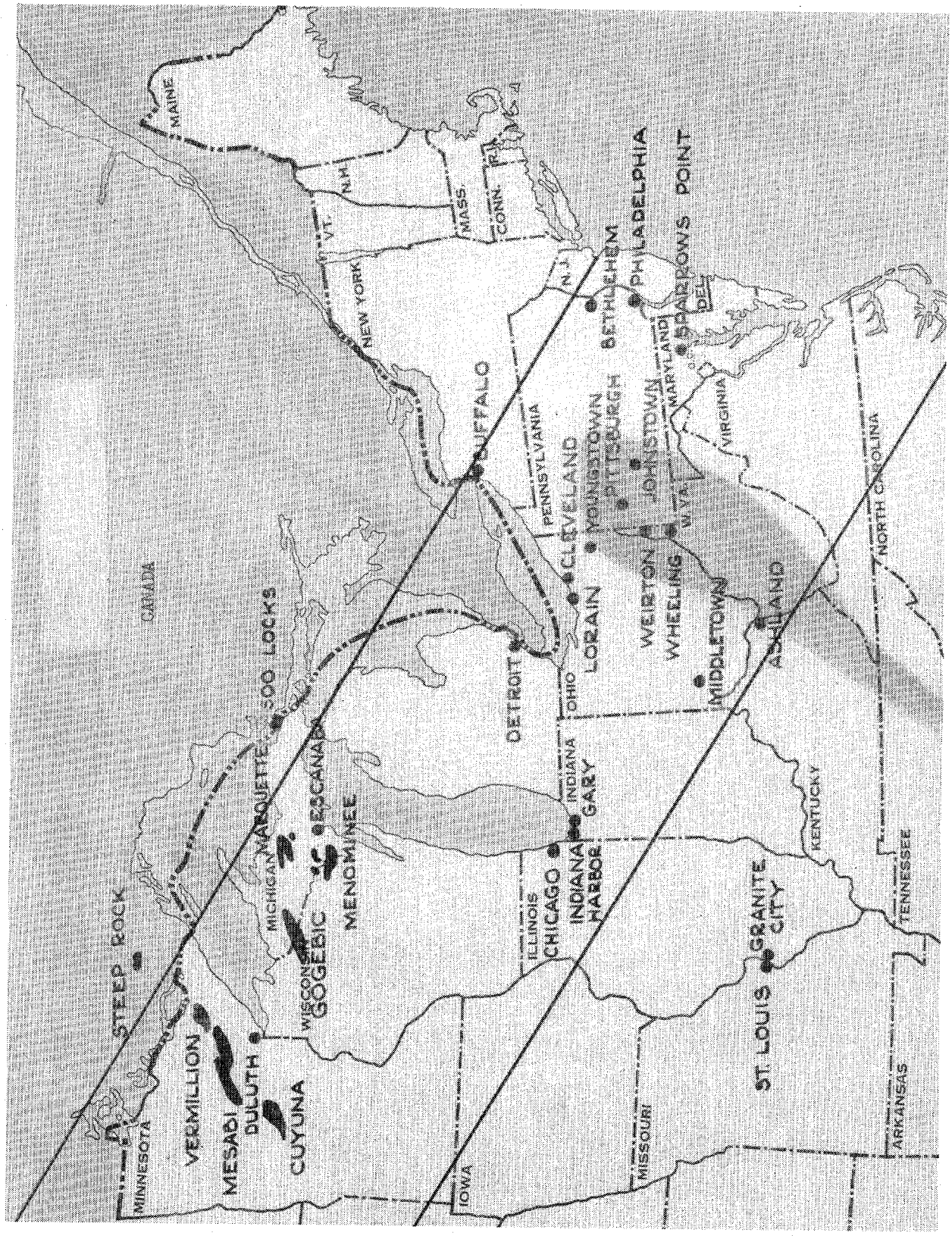
One thing that should be studied very carefully is what production to shut down on if a war should come. We continued a lot of peacetime production pretty late in the war. Of course part of that was due to getting the war machine ready. But you men know a lot better than I do that in the next war we are not going to have much time.

MR. BAUM: Mr. Richards, on behalf of the College I thank you for a very fine lecture and most informative discussion period.

(30 June 1950--650)S.

2016

CHART 1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CHICAGO
GRANITE CITY
ST. LOUIS
SOO LOCKS
MARQUETTE
ESCANABA
MENOMINEE
GOGEBIC
DULUTH
CUYUNA
MESABI
VERMILLION
STEEP ROCK

CHART 2

COMPARATIVE CONSTRUCTION COSTS

	PRESENT FACILITIES	NEW INTEGRATED STEEL PLANTS	ADDITIONAL COST ON NEW PLANT
INVESTIGATION PER N. T. OF ANNUAL INGOT CAPACITY	$60.00	$250.00	$190.00
INTEREST, DEPRECIATION TAXES AND INSURANCE	8%	8%	-
FIXED CHARGES	$ 4.80	$ 20.00	$ 15.20
ACTUAL PROFIT BEFORE INCOME TAXES (1940-1948)	-	-	7.66
LOSS ON NEW FACILITIES	-	-	7.54

MAY 9, 1950

2020