

MAKING STEEL FOR THE WAR

How One Million Workmen and Four Billions of Money Are Fighting the Germans.

GARY, Ind., 1917.



HAVE come from the Iron mines at the head of Lake Superior on a vessel loaded with ore to the great steel plants here at the foot of Lake Michigan. My steamer had a cargo of 12,000 tons. She unloaded this in less than five hours and the ore is already on its way to the furnace. By the time this letter is published it will have been made into steel, and will have gone out with other sister cargoes into steel rails, big guns and shells and the thousand and one other forms in which Uncle Sam is using steel in our fight with the Germans. Last year, when we were still out of the war, we sold to England and France four or five million tons of steel shells and 766,000,000 pounds of barbed wire for entanglements. That steel would have filled a train of fifty-ton cars as long as from New York to Chicago, and the barbed wire would have been enough to build a nine-strand hog-tight fence around the world on the line of the equator. Those were the sales of one year and of only two items. They were made when we had not yet begun to fight. Now, we are in the struggle with every atom of muscle and every bit of machinery we can command. The government is taking the produce of all the steel plants, and the output will be greater than ever before. The plants are now backed by more than four billions of capital. Every worker in steel and iron has been drafted into the industrial army and we have today more than a million such men in the ranks.

Away down here at the foot of Lake Michigan are two of the biggest camps of this army of iron and steel. Although officered by the United States Steel Corporation, they are now under the government and they are fighting the battle after the most improved methods of modern efficiency. It is to show you something of what they are doing that I have come here to South Chicago and Gary. But first let me show you how strategically the two camps are located and how well they are fitted for waging the war. They are situated on the deep waters of Lake Michigan, where the ore from the mountains of Lake Superior can be shot from the ships almost into the furnaces, where coal and limestone can be cheaply secured and where the steel products can be rapidly transported to any part of the world.

The South Chicago plant is a part of the city of Chicago. This section has about eighty thousand inhabitants, and the most of them are supported by the steel works. The town of Gary is just across the Indiana boundary, about thirty miles from Chicago. It has fifty-five thousand inhabitants, and there are about twelve thousand men at work in the mills and the furnaces.

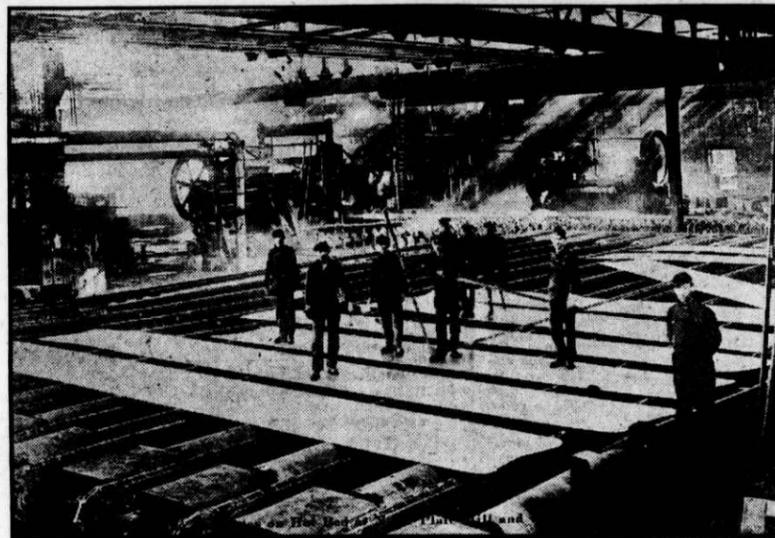
The South Chicago plant is that of the Illinois Steel Company. Its buildings already cover about four hundred acres, and it has more than twice as much more land adjoining it which will eventually be used for the works. The Gary plant belongs to the Indiana Steel Company, another branch of the United States Steel Corporation. It is already three miles long and a mile and a quarter in width, and this whole territory is covered with structures that are very mountains of steel. The towers and turrets of its furnaces stand out like mighty castles against the sky and its huge buildings are willed with masses of machinery that seem to move on ball bearings. A network of railroad tracks runs in and out through the works, and great pipes of steel, some of them so large that a Pullman train could pass through them without touching the walls of the pipe, wind in and out, close to the ground and high above it, carrying millions of feet of gas to the various parts of the works. I do not know the cost of the South Chicago plant, but it has run far up into the tens of millions of dollars. The machinery of the Gary plant alone has cost more than one hundred and forty millions, and the United States Steel Corporation is now spending millions more in connection with it.

Today, owing to the demands of the times, new construction is going on at both plants. Gary is building four new blast furnaces and a great establishment for making wheels of forged steel. She is putting

Frank G. Carpenter Visits the Steel Camps at South Chicago and Gary—He Describes the Mighty Furnaces and Their Wonderful Efficiency—Saving the By-Products—An Army of Patriots. Side-lights on an Industry Upon Which Depends the Life of the Nation.

in fourteen boilers to utilize the waste heat of her open-hearth furnaces and is installing new engine shops, new boiler shops and other works for increasing the by-products. At the Illinois steel plant they are installing electric open-hearth furnaces, extending their foundries, building great gas-driven blowing engines and adding to their establishments for turning out Bessemer steel.

I despair of making you see the immensity of these mighty creations and the wonderful equipment they furnish for fighting the war. Take the blast furnaces. The Illinois and Indiana steel companies have twenty-nine, which are now blazing away night and day. They work holidays and Sundays, year in and year out, and since



Making Steel Plate at South Chicago.

they have been built many of them have been smelting iron continuously for 98 per cent of their running time.

Each of these furnaces is as big around as a haystack and as tall as an eight-story house. It has four great stoves, almost as big and twenty feet higher, which heat the air blast to a temperature of from twelve hundred to sixteen hundred degrees before it is forced into the furnace, and it holds a charge of about seventeen hundred tons of ore, limestone and coke, which this heat turns to liquid. These furnaces each cost in the neighborhood of a million dollars to build, and they would cost two or three times that if constructed today. They are the best of their kind and those of the Illinois Steel company alone are now turning out more than two million tons of pig iron a year.

I shall not describe the process of smelting. The story of pig iron has often been told. The object of the furnace is to rob the ore of its oxygen and other impurities and leave only the iron. This is done by dropping alternate layers of coke, limestone and iron into the mighty towers and admitting at the bottom a hot blast, which melts the whole into liquid mass. Of this mass the iron, on account of its weight, drops to the bottom of the furnace and the impurities of the ore and the limestone float like soap suds on top. Then by making a hole in the furnace just above the surface of the iron, the impurities can be drawn off in the form of slag, and later on, from a lower hole the pure pig iron can go out the same way.

This process is old, but the machinery with which it is carried on at Gary and South Chicago is new. Almost all the work is done by machinery. The ore, limestone and coke are carried up in skip buckets which take less than a minute to raise their contents from the ground into the furnace. A single load is from fifteen to thirty thousand pounds, and the pulling of a lever raises

this to the height of eighty feet and drops it into the furnace. It requires two tons of ore for each charge. The limestone and coke go the same way, and the furnace is practically filled with the aid of one man. The handling of the iron and slag as they come from the furnace is largely done by machinery, and iron, steel and electricity do most of the work.

Steel making is rapidly becoming an exact science and everything is tested by chemical and physical analysis. The ore is analyzed when it comes from the mine, and it is analyzed again at the furnaces. The limestone is analyzed and so is the coke, and when the pig iron flows forth a sample is taken from every forty-ton ladle and carried away to the laboratory to see that it is exactly right for the making of steel. There are more than one hundred chemists at Gary alone, and there is practically an equal number at South Chicago. Their work goes on day and night and they aid in the experiments made for saving the waste, as well as to the bettering of the steel.

Few people realize how closely the great industrial plants of today watch the pennies, and how much they will spend to save a fraction of a cent in a process. Last year

as it flows out in a mass of liquid fire from the furnaces, is dropped into water in such a way that, instead of becoming a solid rock, it turns into granules or a powder not unlike sugar. It is on about the same principle that shot are made by dropping the molten metal from a great height in the shot-tower. In this powdered form it is mixed with limestone, an equal part of lime being added, and it then becomes the very finest of Portland cement.

Continuing the story of saving the waste, the scrap iron, and even the sparks from the furnaces are gathered up and used over again. There is considerable scrap from each charge, and this is often in huge lumps. It has to be broken before it can be used, and this is done by the means of a magnet connected with the electric dynamo of the power house. The touch of a button throws the electricity into the magnet, which, attached to a steel cable, is so dropped that it just kisses, as it were, a steel ball as high as a man. This ball weighs six tons, but it flies up with the amorous kiss of the magnet, the cable raising it to the height of a seven-story house. Then, by the touch of a button, the electricity is removed and the great weight drops on the scrap. Think of lifting so much steel that it would take twelve horses to haul it on a wagon over country roads, to a height of seventy feet, and you have some idea of the power of this magnet. The same force is used for loading the steel plates intended for our battleships. They have magnets here that would lift fifteen tons of such plates and lay them on the cars as gently as you drop your baby on the pillow at night. This is so notwithstanding some of the plates are each as big as a bed quilt.

The war is rapidly increasing the by-products coke ovens. I found this so in Alabama, and it is being carried on to an even greater extent at the foot of Lake Michigan. There are by-product coke plants at both South Chicago and Gary. The Gary plant is one of the largest in the country. It consumes 10,000 tons of coal every twenty-four hours, and the coal is the best that can be obtained. It comes from the Pocahontas mines, the quality of which is equal to that of the Cardiff mines of England.

This coal is of about the same character as that which was formerly used in the old bessemer ovens, resulting in a product of coke equal to 60 or 65 per cent of the coal. The remaining 30 per cent of the coal was lost, going out in volatile gases which dissolved in the air. It took seventy-five hours to reduce the coal to coke and that was the result.

Today they make coke in about one-fifth of that time, and they get 80 per cent of the coal contents of the coke, while the remaining 20 per cent is nearly all saved in the way of by-products. This 20 per cent comes out in gas, which, in the Gary plant,

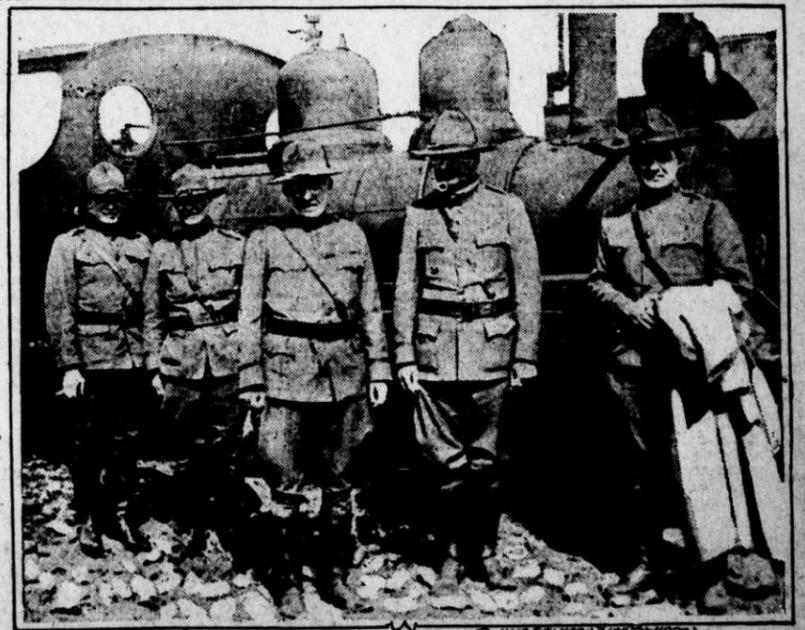
amounts to about one hundred million cubic feet every twenty-four hours. This is run through a by-product plant which takes out of the gas vast quantities of ammonia liquor and the ammonia sulphate which is now being used to increase our food supply. From this same gas also comes benzol, which has many of the properties of gasoline, and is used largely in the industrial arts. It furnishes also a certain percentage of taluol, a powerful explosive which is now used on the battlefields of Europe and also tar and Naphthalene. Indeed, of all that goes into the coke plant today practically nothing is lost. The meat packers claim to save all of the hog but the squeal. The steel makers are now saving almost every bit of the raw materials, except the noise and shriek of the engines, and in the electric work of today, that seems to have almost disappeared.

As it is now, they have here at Gary 560 of these great by-product ovens, and they expect to increase this number to 700, so many that it will require 12,500 tons of coal per day to operate them. In the past the coal went into the beehive oven in a lump. It is now crushed to a powder or flour, so fine that the grains will pass through a mesh of 90 holes to the inch. After crushing it is carried into the furnaces by conveyors and it drops automatically into the oven. When the oven is full it is so sealed that it is impossible for the air to get in or the gas to get out. It is then in a huge steel box, about which a blazing heat of 1200 degrees Fahrenheit plays. It takes this heat to release the gases of which the by-products are made, and to transform the coal to coke of just the right quality for the making of steel.

And now let me tell you something about the soldiers of this great branch of our industrial army. As I have said, there are more than a million iron and steel makers now in the ranks and they are among the most efficient of our troops here at home. There are more than 250,000 men in the employ of the United States Steel Corporation alone, and here at the foot of Lake Michigan they have twenty or thirty thousand working away in the plants I have described. A large number of the men are foreigners, many being Russians and Poles. They are nearly all patriots, and they are subscribing liberally to the Red Cross funds and the liberty bonds. When the Y. M. C. A. raised its first war fund of \$3,000,000, \$3000 was expected from South Chicago. The matter was brought before the employees of the Illinois Steel company there, and it was suggested that each of them give the pay of one hour a month for the term of eight months. Nearly every employe promised to do this, and the result was that they raised \$26,000 instead of \$3000. The 12,000 employes of Gary have also done more than their share, and this is true of nearly every branch of steel workers all over the country.

FRANK G. CARPENTER.

AMERICAN ENGINEERS DOING BIG WORK ON WESTERN FRONT



Commanders of the American engineers in France.

The American engineers now in France have been doing excellent work on a front where engineering skill is so great a need. Much of the work of the Americans has been the construction of railways. A recent photograph shows the commanders of the American engineers on the scene of their work near the British lines.