Gary: The Largest and Most Modern Steel Works in Existence.

The rapid increase in the business of the United States Steel Corporation rendered it necessary, some four years ago, to make a considerable increase in its plant. The more or less congested conditions surrounding the various existing establishments led the company to search for a site where a large area of land could be purchased at a reasonable price, and which would be located within economical hauling distance of the great centers from which the supplies of ore, coke, and limestone could be derived. Such a location was found in the State of Indiana on the south shore of Lake Michigan, some twenty-five miles south of the city of Chicago. Here the company purchased a tract of over 9,000 acres, with a frontage on Lake Michigan of seven miles. One thousand acres of this property, including a water front two miles in extent, was selected as the site of the new steel plant. The property was a dreary waste of drifted sand, entirely uninhabited and covered with a scanty growth of grass and scrub timber. It was an ideal location for the purpose; for on one side it was accessible by the ore-carrying steamers from Duluth, and on the other side it was served by several trunk railroads over whose tracks the coke and limestone could be brought in and the finished products hauled away, without any intermediate handling or trans-shipment.

With such a virgin site to build upon the designers of the plant were able to work with a free hand; and the component parts of this, the greatest steel plant in existence, were therefore laid out with a strict regard to the economical handling of the enormous masses of raw material and finished product. It can be understood that where the total tonnage of material handled in any industrial establishment runs into the millions, it is of the highest importance that this material shall pass from process to process, from building to building, with as little handling and as short a haul as possible; and in laying out the huge open-air structure and inclosed buildings which cover the 1,000 acres that include the present plant, strict attention was paid to this feature. Furthermore, advantage was taken of several recent improvements in the art of steel manufacture, notably that of utilizing the blast furnace gases in gas-driven power plants to operate the blowing engine and provide electrical power for the operation of the various mills. Apart from the vast extent of the plant the feature which has attracted the attention of the engineering world to the Gary steel plant is the great economies which have been effected by the use of gas-driven engines of great size for the generation of practically all of the power required for operating the machinery. The plant is owned by the Indiana Steel Company, to whose vice-president, Mr. G. G. Thorp, we are indebted for assistance in the preparation of the present article.

Work was commenced in March, 1906, and at the present time over one-half of the plant has been completed and is in operation. The work of construction is being steadily prosecuted and when the whole work is finished the equipment will be as follows:

A harbor, with complete ore-unloading facilities, and a storage yard capable of accommodating 5,000,000 tons of ore.

Sixteen modern blast furnaces, having an annual capacity of 2,400,000 tons of pig iron.

Six open-hearth furnace buildings, each containing fourteen 60-ton furnaces. The combined annual capacity of this plant is 3,750,000 tons.

A billet mill and a rail mill, the largest in the world, capable of turning out 4,000 tons of rails per day; plate mills, an axle-making plant, and a large group of merchant mills, the above plants having a combined capacity sufficient to roll all of the steel that can be produced in the open-hearth furnace plants.

A blowing plant of a total capacity of 92,000 horse-power for furnishing air to the blast furnaces, operated by gas engines of 64,000, and steam engines of 28,000 horse-power total capacity.

An electric power plant, driven by gas engines of a combined capacity of 120,000 horse-power, for operating the various mills.

A complete equipment of mechanical shops at which all of the repairs can be made and much of the machinery required by the plant.

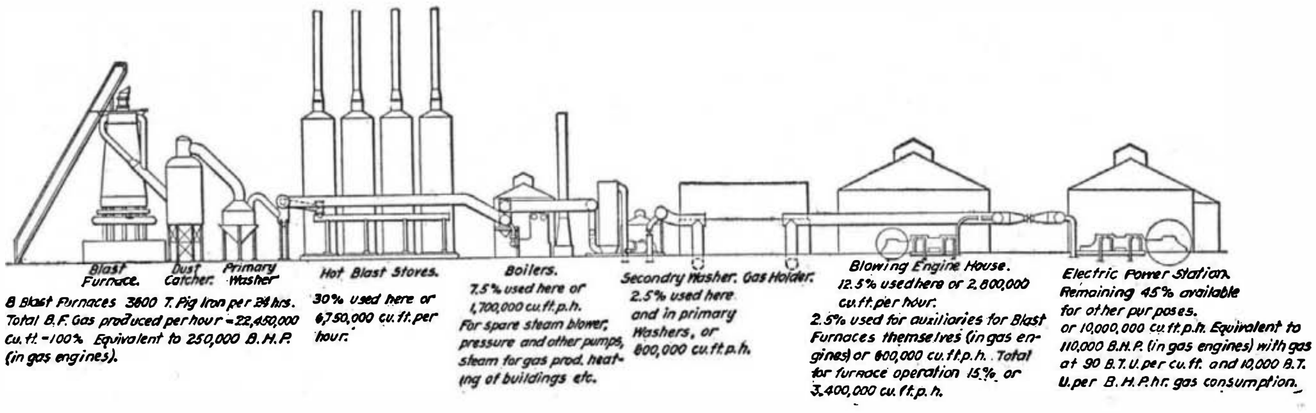


DIAGRAM SHOWING THE DISTRIBUTION OF THE FURNACE GASES AT GARY.

A water supply system, served by two 10-foot conduits leading from Lake Michigan, whose pumps are capable of supplying 170,000 gallons of water per day under a head of 120 feet.

A railway system extending throughout the plant which includes 125 miles of standard railway track.

TOWN OF GARY.

Adjoining the steel plant the company has built an entirely new town for the accommodation of its employees. Already it houses some 15,000 people, of whom about one-third are employed at the works, and includes about 500 dwellings, three hotels, and a schoolhouse built by the company. Also many dwellings and business blocks have been erected by private persons. The town has been laid out on the most approved modern lines with broad, brick-paved, concrete, or macadam streets and cement sidewalks. It contains its own waterworks and gas plant, and the whole town is lighted from a large generating station in the steel plant. Space has been reserved for two recreation parks, and everything is being done to render this city comparable with the best model industrial cities of the country.

THE ORE DOCK AND UNLOADING APPLIANCES.

When the ore steamers from Duluth arrive at Gary, they enter an artificial canal, 22 feet deep and 250 feet wide, which extends at right angles with the shore line for a distance of 4,650 feet inland, when it widens out into a 750-foot diameter turning basin. The west bank of the canal adjoining the steel works is formed by a massive concrete retaining wall, back of which, extending parallel with the canal, are the ore unloaders, the ore-handling bridges, and a vast open concreted area, with concrete walls on either side, for the storage of the ore for winter use. The completed plant will include ten unloading machines of the Hulett type. Each machine consists of a massive walking-beam, at the outer end of which is a vertical arm ending in a 10-ton grab bucket. The steamer is moored alongside the concrete bulkhead, and as soon as the hatches are off, the unloaders thrust their 10-ton buckets into the holds, bring up the ore, and deliver it to a conveyer car, which runs back and discharges it into a trough on the edge of the stockyard, or into a hopper on the machine from which it can be shot into cars. The machines will have a combined unloading capacity of 2,500 tons of ore per hour. Working in conjunction with the Hulett unloaders will be ten Hoover & Mason traveling conveyer bridges. These huge structures, five of which are shown in our panoramic view of the steel works, are about 500 feet long. They extend from the concrete trough, before mentioned, into which the Hulett unloaders discharge, clear across the whole width of the stockyard. Each bridge is provided with a 15-ton grab bucket, by which the ore is picked up from the trough and deposited in the stock pile, from which it is picked up again as it is needed and loaded into the blast furnace supply cars. The object of the huge storage yard, which is 4,000 feet in length, is to enable the company to provide a sufficient supply of ore to operate the plant during the five months of the year when lake navigation is suspended. Its total capacity is about 5,000,000 tons.

THE BLAST FURNACES.

Back of the stockyard and extending parallel with the same are eight blast furnaces (to which eight more will be added), each with its equipment of four hot-blast stoves. The blast furnaces are 88 feet in height from the tap hole from which the hot metal is drawn to the top of the furnace lining, and the capacity of each is 450 tons per day.

Between the stock pile and the furnace is a long line of elevated storage bins arranged in two parallel rows. One row is for coke and the other for ore and limestone. Above the bins are four tracks on which travel two 60-ton electric transfer cars. The ore is loaded into the transfer cars by the buckets of the overhead ore bridges. The coke and limestone are brought up over the bins by rail and deliver their load directly by gravity. At the bottom of the bins are spouts controlled by electrically operated gates, and below these are tracks which run the full length of the bins. Traveling on these tracks are electrically operated lorries into which the ore, coke, and limestone are delivered from the bin spouts. The lorries carry the materials to what are known as the "furnace skips," of which there is a pair to each furnace. The skips run upon an inclined railway which runs direct from a pit below the transfer cars to the charging platform at the top of the blast furnaces. Each trip of the skip is made in about 60 seconds, and its average load consists of about 7,000 pounds of ore, or 6,000 pounds of limestone, or 3,600 pounds of coke. The operator merely starts the skip on its journey. Its journey up the incline and the halt at the charging platform above are purely automatic.

The blast furnace is a huge steel shell lined with a thick wall of firebrick. Its interior diameter is 15 feet at the base or hearth, 21½ feet at a height of 13 to 21 feet above the hearth, 16 feet at the top. It is loaded full with a charge of coke, limestone, and iron ore. The air for combustion is introduced through a series of water-cooled tuyeres, which enter the furnace near the top of the hearth. This air is supplied by huge blowing engines at an average pressure of 18 pounds per square inch. Part of the hot gases from the top of the furnace, after first having been cleaned in the primary washers, are led through the hot stoves, of which there are four, to each furnace, as shown in our panoramic view of the plant. The stoves are huge cylindrical plate-steel structures, filled with a honeycomb of firebrick. The burning of the gases in the stove raises the temperature of the firebrick; and, when this has reached a certain point, the gases are cut off from that stove and turned into another one of the series. At the same time the cold air from the blowing engines is caused to pass through the now heated firebrick of the first stove, where it takes up the heat given up by the combustion of the furnace gases, and returns it to the blast furnace. The operation of the blast furnace is continuous, and the temperature varies from that of the molten iron in the hearth at the bottom to that of the cold charge which has just been introduced at the top. As the charge is reduced, it gradually descends as molten metal and as slag, the slag, because of its lighter weight, floating on the top of the molten metal. At regular intervals the slag and the metal are separately drawn off into ladles, the slag being hauled to the slag pile and the metal being taken to the mixers or cast into pig metal as hereafter described. Each furnace at Gary has a capacity of 450 tons per day.

CLEANING AND DISTRIBUTION OF BLAST FURNACE GASES.

The most striking novelty in the Gary steel plant is the substitution of gas engines for steam engines in producing the enormous quantity of power necessary for operating this huge establishment. The blowing engines, which supply air for the blast furnaces, are operated in part by gas engines of a total of 64,000 horse-power; and all of the mills are driven by electric motors, current for which is produced by electric generators driven by gas engines of the largest size and of a combined capacity of 120,000 horse-power.

Originally, in the early days of steel making, the gases were allowed to escape from the top of the blast furnace and go to waste. Then the tops of the furnaces were closed and the gases were conducted to large boiler houses, where they were used to raise steam for driving the steam blowing engines throughout the plant. In the latest improvements as installed at Gary the whole of the gases are utilized. The diagram shown herewith gives the distribution of these gases, and it should be remembered that the figures given are for eight furnaces only, which together produce 22,450,000 cubic feet of gas per hour. When the whole sixteen are running the total production will be about 45,000,000 cubic feet per hour. Of this amount 30 per cent is used in heating the hot stoves, in which, as we have seen, the air is heated before entering the blast furnaces. The steam boiler plant uses 7.5 per cent, 2½ per cent disappears in the gas washers, the blowing engines 12½ per cent, and 45 per cent is available for the gas engines in the electric power station. All the gas from the top of the blast furnaces first passes through dust catchers and a primary washer, which remove the larger part of the solid impurities; and that part of the gas which is burned in the hot blast stoves and under the boilers goes direct from the primary washer to its destination. The gas which is destined for the gas engines passes through another washing plant, of which there are four to each pair of blast furnaces. The gas as thus

(*Continued on page 450.*)

to present photographic views of several types of unloading machinery as installed for the unloading of iron ore, coal, and other heavy materials in bulk at various ports on the Great Lakes. During the recent meeting in New York of the Society of Naval Architects and Marine Engineers, a paper was read on Material Handling Equipments for Lake Vessels which traced the development of this type of machinery from the year 1880. At that time dock managers were looking for some mechanical means for lifting the ore from the ship and depositing it at some distance from the face of the dock; and this was first accomplished by a cableway machine, built and erected at Cleveland in 1880 under Mr. Alex. E. Brown's supervision. From that first device have been developed the mammoth machines of the Brown hoist type. They consist essentially of a long overhead bridge extending at right angles with the dock and supported on two towers, one at the dock, the other 200 to 300 feet inshore. Upon the bridge are rails, on which travels a self-propelled trolley. Upon the trolley are motors for hoisting the load and for moving the trolley to and fro upon the bridge. In unloading, the trolley runs out over the hold; the grab bucket descends and grabs its 5 to 7 tons of ore; raises it, and then the trolley travels back to the stock pile, where the load is dropped.

GARY: THE LARGEST AND MOST MODERN STEEL WORKS IN EXISTENCE.

(*Continued from page 441.*)

purified has an average heat value of 95 British thermal units per cubic foot.

It is estimated that 2½ times as much power can be derived from a given quantity of gas with gas engines as with boilers and steam engines.

THE OPEN-HEARTH FURNACES.

The hot metal is tapped from the bottom of the furnaces into 40-ton ladles, mounted on massive eight-wheeled trucks, which are hauled successively beneath the pouring spout. When a train of ladles is made up it is hauled to the mixer building, which contains two huge receptacles, each of 300 tons capacity. Into these the ladles discharge the hot metal, and the mixing of the product of the different furnaces insures a uniform average of composition of the metal. From the mixers, which are arranged so that they can be rocked or tilted, the molten metal is poured into 60-ton charging ladles which are conveyed to the charging side of the open-hearth furnaces on electric transfer cars. From these cars the ladles are picked up by a 75-ton traveling crane and the metal is poured into the open-hearth furnaces through a runner.

The whole of the output of the Gary plant consists of open-hearth steel, and the open-hearth furnace plant is by far the largest of its kind in the world. It is housed in large steel-frame buildings, 193 feet in width and 1,190 feet long. Ultimately there will be six of these buildings, each containing fourteen 60-ton furnaces, or eighty-four furnaces in all. To the molten metal with which each furnace is charged there is added a certain amount of steel scrap; and the charge is then subjected to the fierce heat of burning gases which enter at one end of the furnace, pass over the charge, and leave through flues at the other end. From time to time samples are taken from the furnace and tested. The object of this treatment is the same as that of the air blast in the Bessemer converter, and though the operation consumes more time the product is very much more reliable. The impurities are burned out of the metal until the proper percentage of carbon, etc., for the particular grade of steel which is being made has been reached. The metal is now ready for pouring.

Down each side of the long line of open-hearth furnaces is a set of railroad tracks on which the metal is brought to or removed from the furnaces, and handled thereat. On the tapping side on which the treated metal is withdrawn from the furnaces is a line of massive standards in which are placed the ladles of 80 to 100 tons capacity into which the metal is poured. When they are full, the proper amount of ferro-manganese is added to the metal in each ladle, and they are then picked up by 125-ton traveling cranes and carried to platforms, from which, by opening a plug in the bottom, the molten steel is poured into the ingot-molds, large cast-iron molds 65 inches in height, tapering from 20 by 24 inches at the bottom to 18¾ by 22¾ inches at the top. Here the metal cools to the point of solidification. The mold is then lifted off the ingots which, by the way, are carried on four-wheeled cars, each car carrying four molds, and after having been heated to a uniform heat throughout in the "soaking pits" the product is ready for rolling in the billet mill or the rail mill.

It should be mentioned that in order to take care of the product of the blast furnaces on Sundays and holidays, when the open-hearth furnaces are not at work, the hot metal is brought in ladles to the casting machine, where it is poured into an endless chain of traveling molds which passes continuously below the mouth of the ladle. There will be eleven of these machines for the service of the complete plant.

BILLET MILL.

Standing parallel with the rail mill is an electrically operated billet mill, in which a portion of the ingots are rolled down to suitable size for further manipulation throughout the plant. Here are four 40-inch blooming mill stands, each pair driven by a 2,000-horse-power electric motor, and a five-stand continuous 32-inch mill driven by a 6,000-horse-power motor. Beyond this are two blooming shears, 12 x 12 inches and 10 x 10 inches. Next, the blooms go to a 24-inch 6-stand continuous mill, driven by a 6,000-horse-power motor, or to a pair of cooling beds for shipment. If further reduction is desired the billet is sent to a 6-stand 18-inch continuous mill and rolled down to sizes varying from 3½ inches square to 1¾ inches square.

LARGEST RAIL MILL IN THE WORLD.

The Gary plant contains the largest rail mill in existence. It is also the only electrically driven mill which rolls rails direct from the ingot without reheating. The proportions are immense, the main building being 990 feet long by 76 feet wide, with another building containing the soaking pits, for both rail mill and billet mill, which is 1,350 feet long by 84 feet wide. The soaking pits are square chambers with hydraulically-operated sliding doors in the roof, capable each of holding four 4-ton ingots. They are heated by gas and in them the ingot is brought up to the proper temperature for rolling. The roll trains are driven by six 6,600-volt induction motors, three of 6,000-horse-power and three of 2,000-horse-power. The finished rails are taken to inspection beds in a finishing department and are then loaded on the cars. This rail mill can turn out 4,000 tons of 80-pound rails in twenty-four hours.

GAS-ENGINE-OPERATED BLOWER PLANT.

Air blast for the furnaces is produced in two buildings, 550 and 600 feet long and 104 feet wide, which are among the most interesting features of the Gary plant. The blowers, of which are are twenty in all, are driven by sixteen gas engines and four steam engines. These blowing engines are of great size and power. The gas and blowing cylinders are placed in tandem. The gas cylinders are 42 inches in diameter and the blowing cylinder 72 inches, and they have a common stroke of 54 inches. Each engine is of 2,000 horse-power and runs at a speed of 60 revolutions per minute, and each delivers 32,000 cubic feet of free air per minute at a normal pressure of 18 pounds per square inch. The gas engines were built by the Allis-Chalmers Company and the Westinghouse Machine Company. When the plant of sixteen furnaces is completed there will be no less than thirty-two of these engines with a total horse-power of 64,000.

GAS-DRIVEN ELECTRIC POWER PLANT.

The most interesting feature of the whole establishment at Gary is the huge power house, 105 feet wide and 966 feet long, which provides the electric current for one-half of the complete plant. It is the largest gas-power plant in the world and contains seventeen horizontal twin-tandem double-acting Allis-Chalmers gas engines of 3,500 horse-power, each directly connected to a 2,500-kilowatt generator, fifteen of which are 6,600-volt alternating-current machines and the other two 250-volt direct-current machines. These huge engines are the largest ever constructed for the use of blast-furnace gas. Their cylinders are 44 inches in diameter by 54 inches stroke. Each twin unit carries on a 30-inch shaft a 23-foot 100-ton fly-wheel. The plant also contains two Curtis steam turbine generators for starting and for auxiliary service in case of necessity. Additional gas-electric engines will be provided in two separate buildings, aggregating 60,000 horse-power. Thus the ultimate capacity of the electric power plant will be 120,000 horse-power.

Limitations of space prevent any more detailed description of the many features of interest which are found at Gary. The combined steel plant and city of Gary are the most noticeable instance in America of the rapidity with which a large area of apparently valueless land may, at comparatively short notice, be transformed into a huge center of industrial activity. Not only is about one-half of the plant in operation, but the adjoining city already has a population of 15,000 souls. Four years ago the site was a wind-blown waste of sand on the shores of Lake Michigan.

THE HANDLING AND STORAGE OF OUR HUGE GRAIN CROP.

(*Continued from page 445.*)

els per hour to cars or boats. It has a rated storage capacity of 2,500,000 bushels; and it may be mentioned here that the elevators of the Armour Company alone are capable of storing 13,500,000 bushels a day. This elevator is constructed entirely of wood, and the square bins, which range in size from 500 to 7,000 bushels capacity, are built of spruce planks, 2 x 4 inches at the top of the bin and 2 x 10 inches at the bottom, laid lengthwise upon each other, and each spiked to the layer below. The whole interior of the main body of the building is built up of a perfect honeycomb of these bins. The bottoms are tapered and finished in spouts to insure a free delivery of the grain in unloading.

The more modern elevators, such, for instance, as those designed by the Metcalf Company and shown in our illustrations, are built of reinforced concrete, the bins being circular in form; are of great strength, and of thoroughly fireproof construction. The square tower-like building contains the elevating, cleaning, weighing, and conveying machinery. At about the middle height of this building horizontal covered passageways serve to contain conveyer belts, by which the cleaned and weighed grain is transferred to the top of the bins and loaded into the particular bin desired.

The annual shipment of grain to Europe is about 150,000,000 bushels, and as our five thousand bushels from the Dakota farm are destined to cross the ocean, we will trace its course from the Chicago elevator in which it is reposing to its final stowage in the hold of an ocean cargo steamer. At the end of its railway journey to Chicago, the grain passes through similar experiences to those it

(*Continued on page 452.*)

NEW BOOKS, ETC.

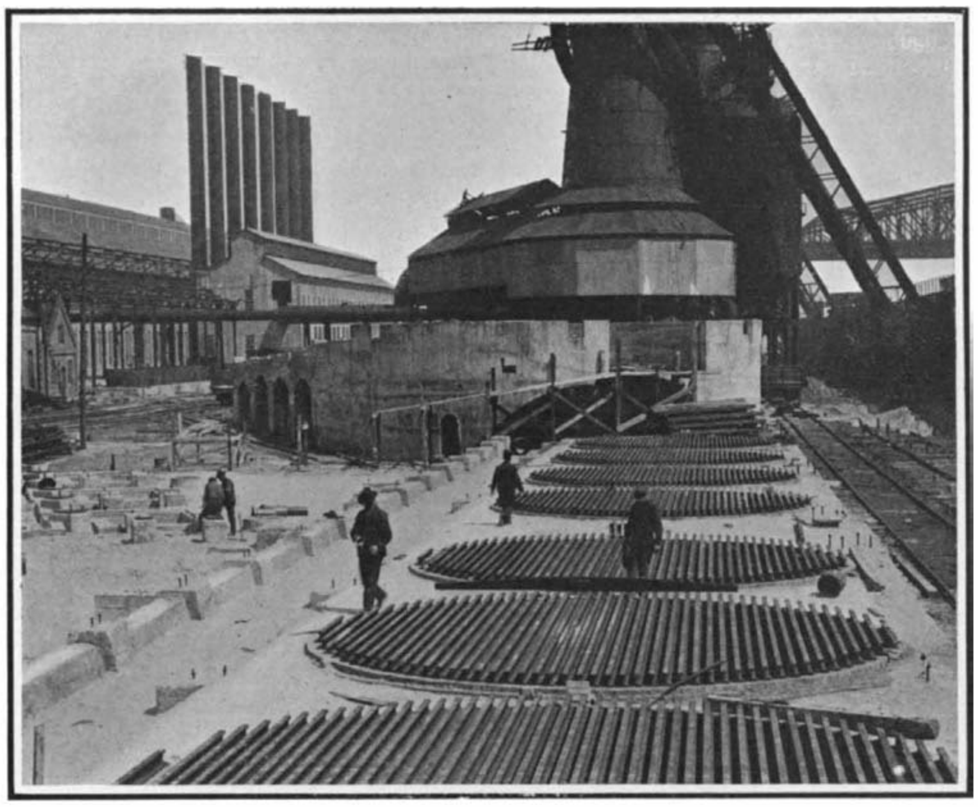
NELSON'S PERPETUAL LOOSE LEAF ENCYCLOPEDIA. Editor in Chief, John H. Finley, LL.D., President of the College of the City of New York. Associate Editors, William Peterson, LL.D., C.M.G., Principal of McGill University, Montreal, Canada, and George Sandeman, M.A., Edinburgh, Scotland. New York: Thomas Nelson & Sons, 1909. Twelve royal octavo loose-leaf volumes, illustrated with colored plates, plans, and engravings.

In these days, when history is making so rapidly as to call for daily and even hourly editions of newspapers, and science is advancing at such a pace that new periodicals are constantly cropping up to announce developments in specialized branches, the mere task of collecting this mass of material, condensing it, classifying it, sifting out the errors, and finally putting it in such a form as to be of value as a record for the well informed man, is in itself stupendous; but it is disheartening to know, as all makers of encyclopedias do know, that the very day after publication, the work is beginning to grow old and out of date. The mass of information which is crammed between the covers of an encyclopedia is living material, matter that is as alive as the age in which we live. Hence, it is inconstant. Part of it is aging and dying, much of it is developing and expanding and is giving birth to new ideas, and the effort to keep all this material in alphabetical order and keep it abreast of the times has always been a serious problem, which the publication of annual volumes has not solved for the reason that the additional matter published contains only the new facts, while leaving the old and worn-out ideas in the original encyclopedia, where they are liable to mislead the reader. A new departure in this line has just been made in the Nelson Loose-Leaf Encyclopedia, which is so arranged that any facts which may become out of date can be taken out of the very heart of the volume and replaced with new material without in the least affecting the alphabetical order or destroying the arrangement as a book of ready reference. The loose-leaf binding is ingeniously contrived to give the volume the appearance of being permanently bound. Nelson's Encyclopedia was first prepared in permanent binding in 1907. When a year later the loose-leaf edition was published, it was found necessary to make 600 changes in order to bring the encyclopedia up to date. A large staff of editors is employed to keep the present encyclopedia up to the hour, and from time to time new leaves are issued and sent to the subscribers, furnishing them with authoritative information on current topics, and informing them where to insert the matter in the encyclopedia. As an illustration of the up-to-dateness of this system, a set of leaves was issued last month on the death of Governor Johnson and on the Cook-Peary controversy. These leaves are temporary, and in March of each year a complete set of leaves of about 500 will be sent to each subscriber to add to his encyclopedia and to replace matter that is out of date. Formerly, a man could obtain better information on the occurrences of the previous decade than those of the current year. With the advent of Nelson's Encyclopedia such is no longer the case. The subjects covered in this work are many, probably a greater variety than is to be found in any other encyclopedia of the same number of volumes. The articles are, therefore, short and concise. The aim of the encyclopedia appears to be to provide general information and to avoid technical language as far as possible, to furnish not merely a record of events, but to give instructions wherever possible that will be of practical value to the reader. Take, for example, the entry "Cycle." Not only is a brief history of the bicycle given, but also instructions to the prospective buyer of a wheel which will enable him to choose the best machine, and hints on the care of a wheel. This strikes us as a rather unique feature, but one that will doubtless be appreciated by many subscribers to this work. The articles are a trifle more brief than one would like to have them, but they are accompanied by carefully selected bibliographies for those who desire to study the subject further. The encyclopedia appears to be an exceptionally good gazetteer, containing many geographical names that do not appear in other works of this kind. A pronouncing dictionary is placed at the end of each volume, so that if a person is in doubt as to the pronunciation of a certain word he can look it up very quickly and without having to wade through the body of the book, where his attention is liable to be diverted by the many interesting subjects which the volume contains.

WILD FLOWERS AND TREES OF COLORADO. By Francis Ramaley, Ph.D. Boulder, Colo.: University Book Store, 1909. 8vo.; 78 pp.

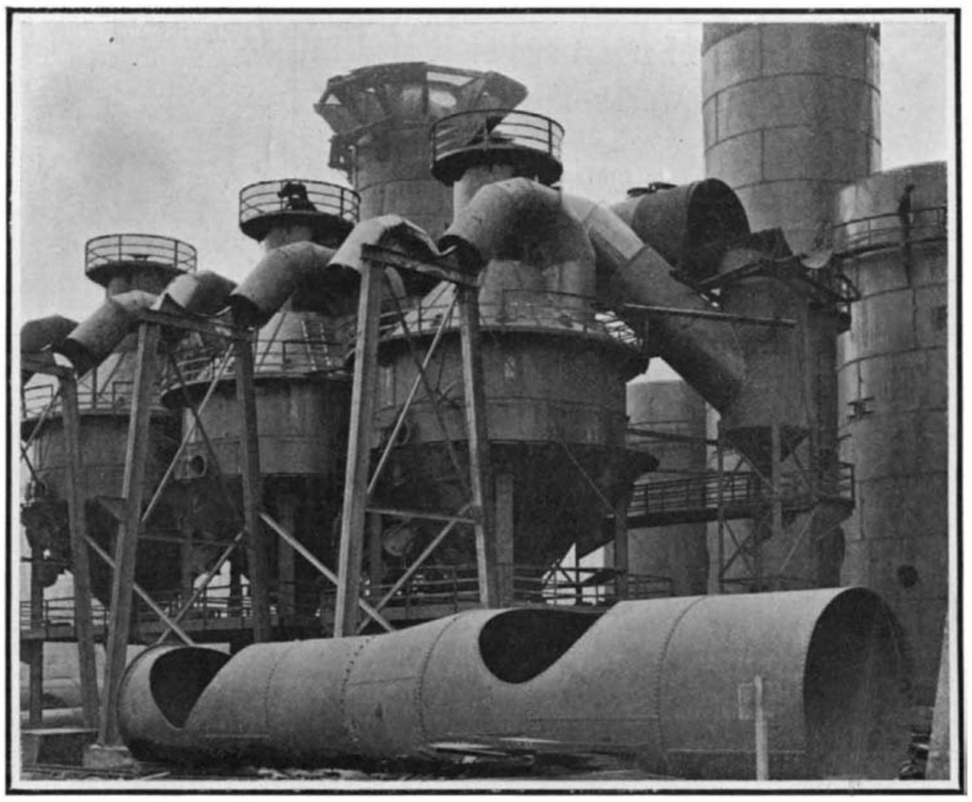
This little volume is intended as an introduction to Colorado plants. It is not a result of book study, but of many summers' work on Alpine heights and on the plains. It will prove of interest to all students of botany, particularly if they live in the State of Colorado.

TABLES AND OTHER DATA FOR ENGINEERS AND OTHER BUSINESS MEN. By Charles B. Ferris, B.S. Knoxville, Tenn.: Published by the University Press. Price, 50 cents.



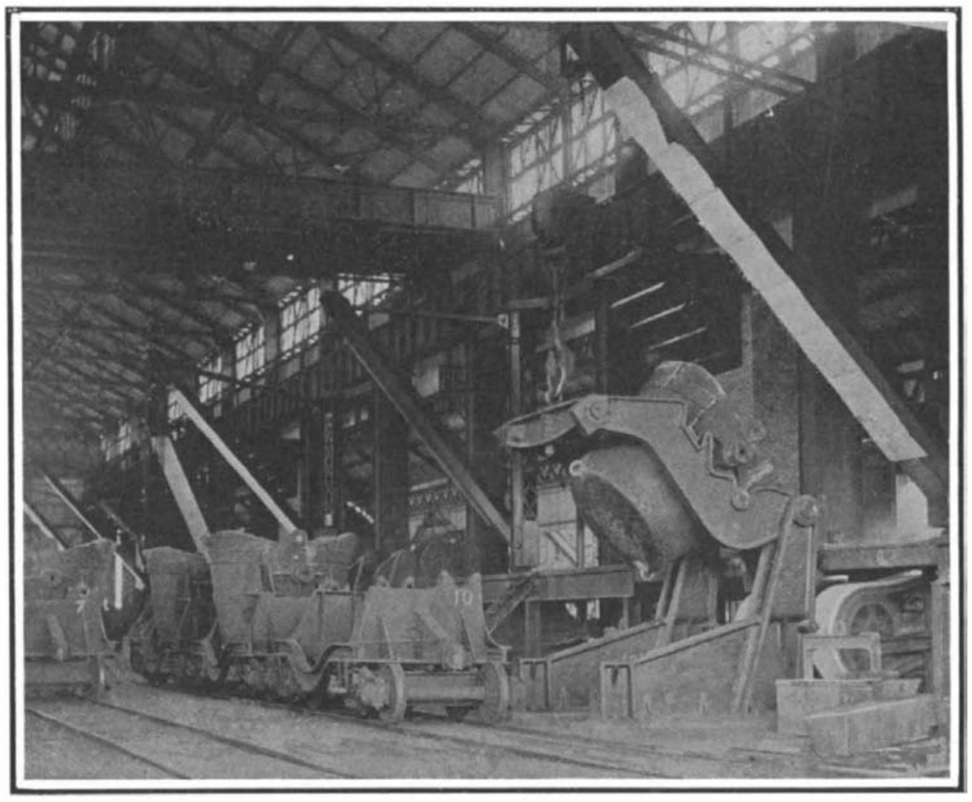
The air blast is heated in the hot stoves before entering the blast furnaces,

Steel rail and concrete foundations for the hot stoves.



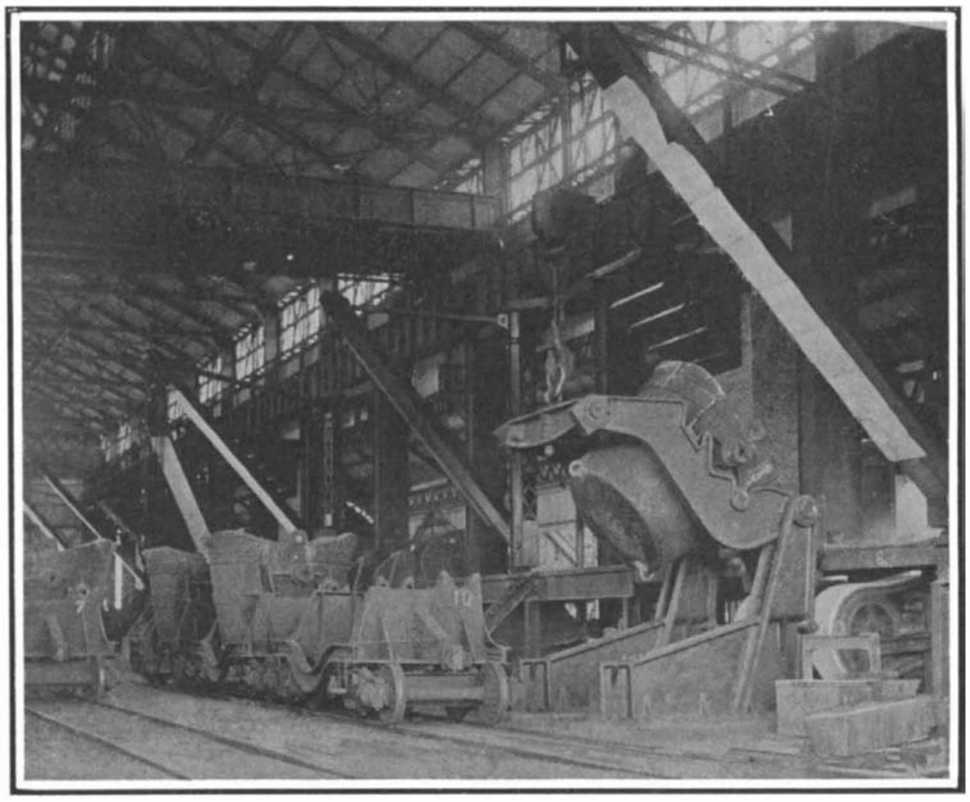
The power for operating the Gary plant consists of huge gas engines driven by the furnace gases.

Dust catchers and washers for purifying the furnace gases.



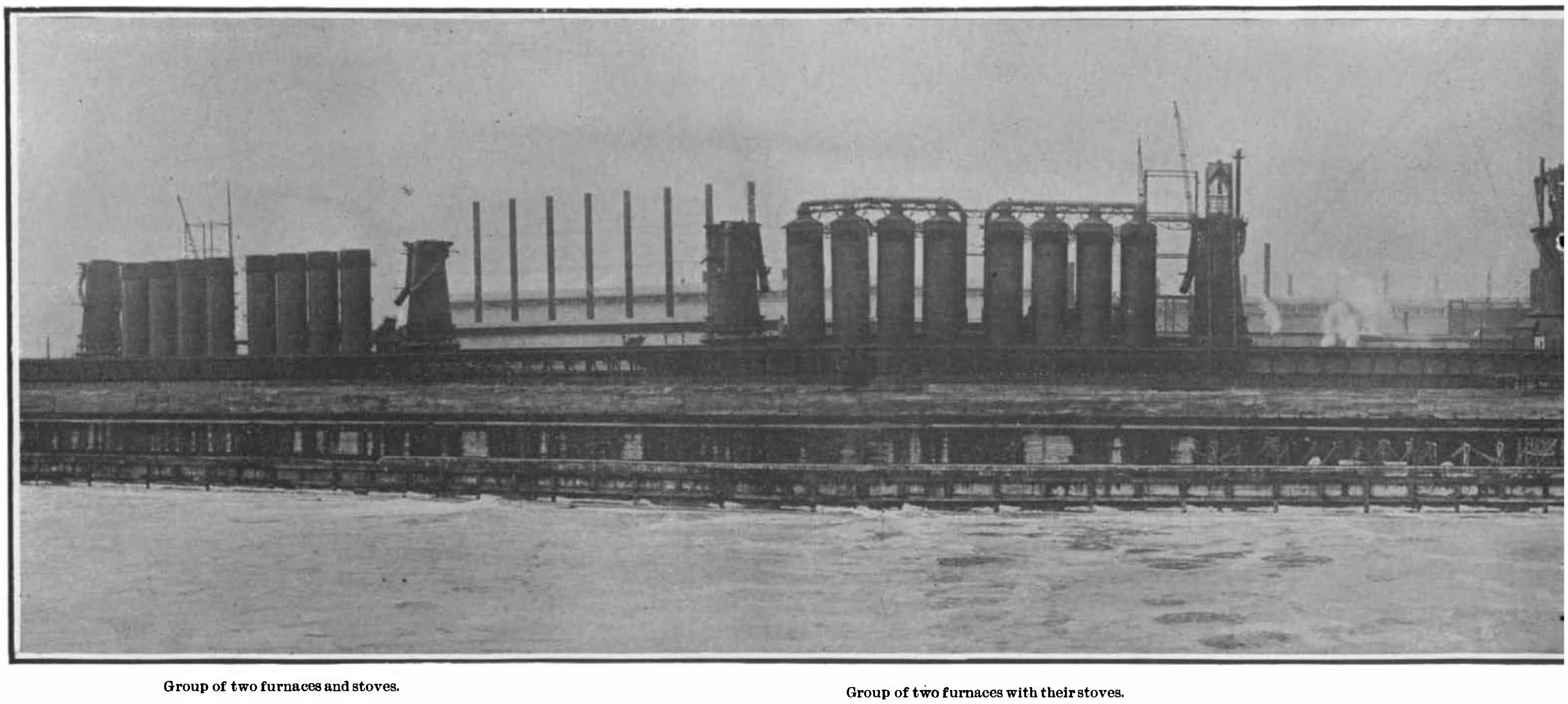
The molten iron from the furnaces is brought to the open hearth furnaces in 60-ton ladles, one of which is here shown.

Charging platform of the open hearth furnaces.



On Sundays and holidays the hot metal from the blast furnaces is cast into pigs.

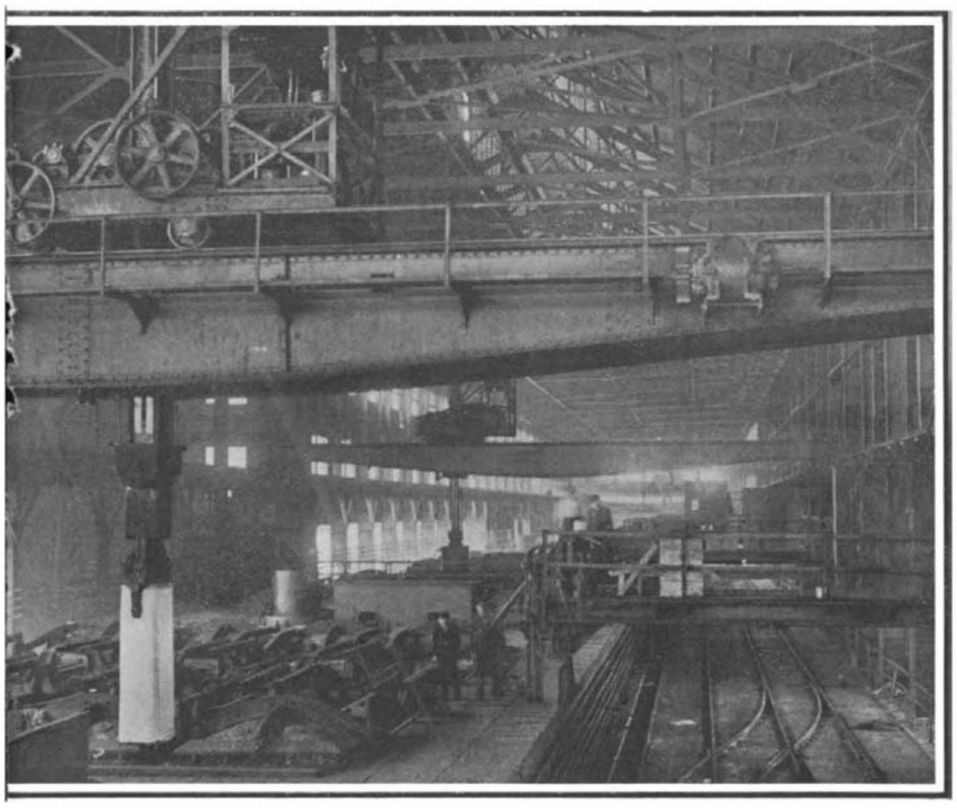
Interior of the pig-casting machine building.



Group of two furnaces and stoves.

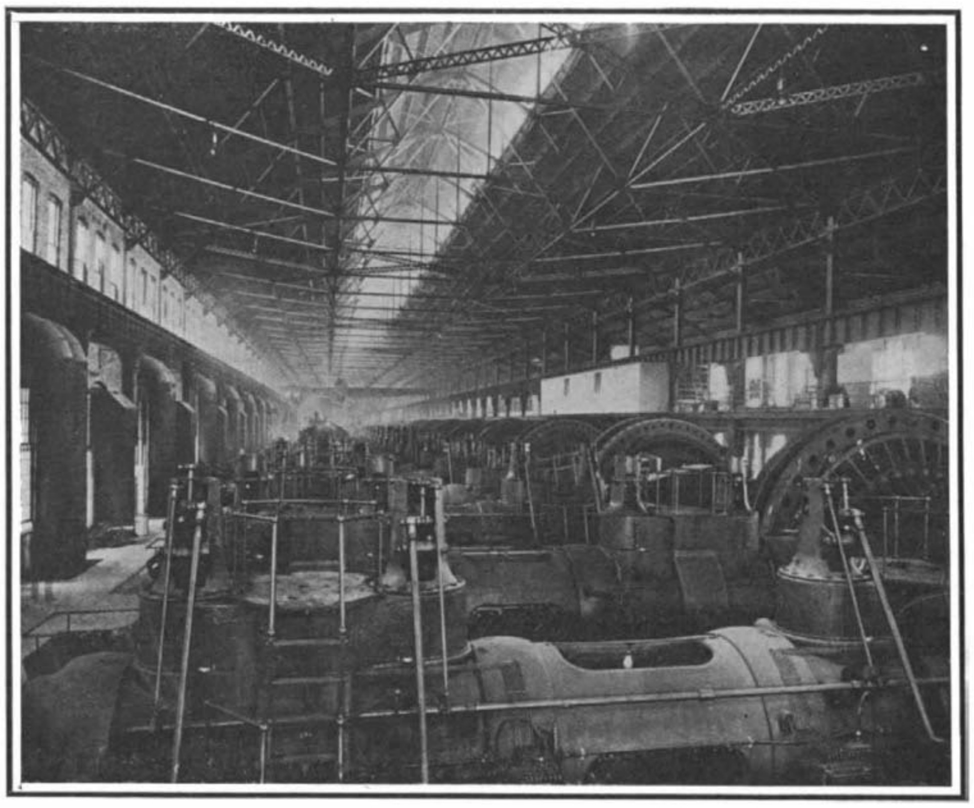
Group of two furnaces with their stoves.

PANORAMIC VIEW OF GARY STEEL PLANT, TAKEN FROM THE ARTIFICIAL HARBOR, 5,400 FEET IN



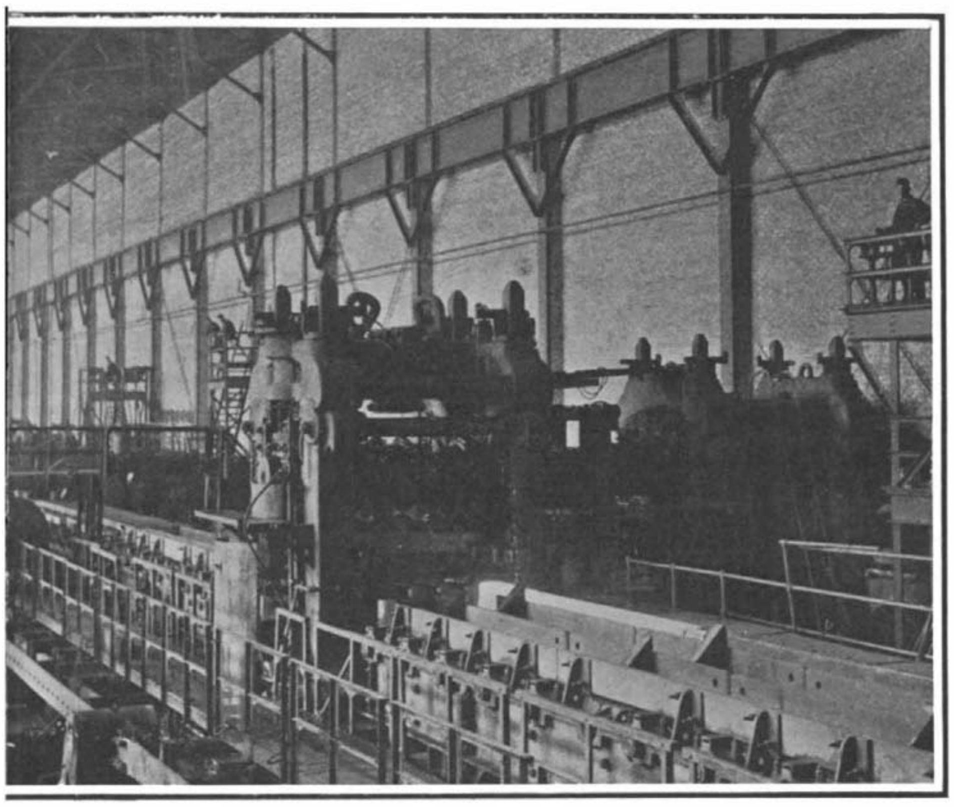
Here the ingots are heated in gas-fired underground furnaces to the proper temperature for rolling.

The soaking pits.



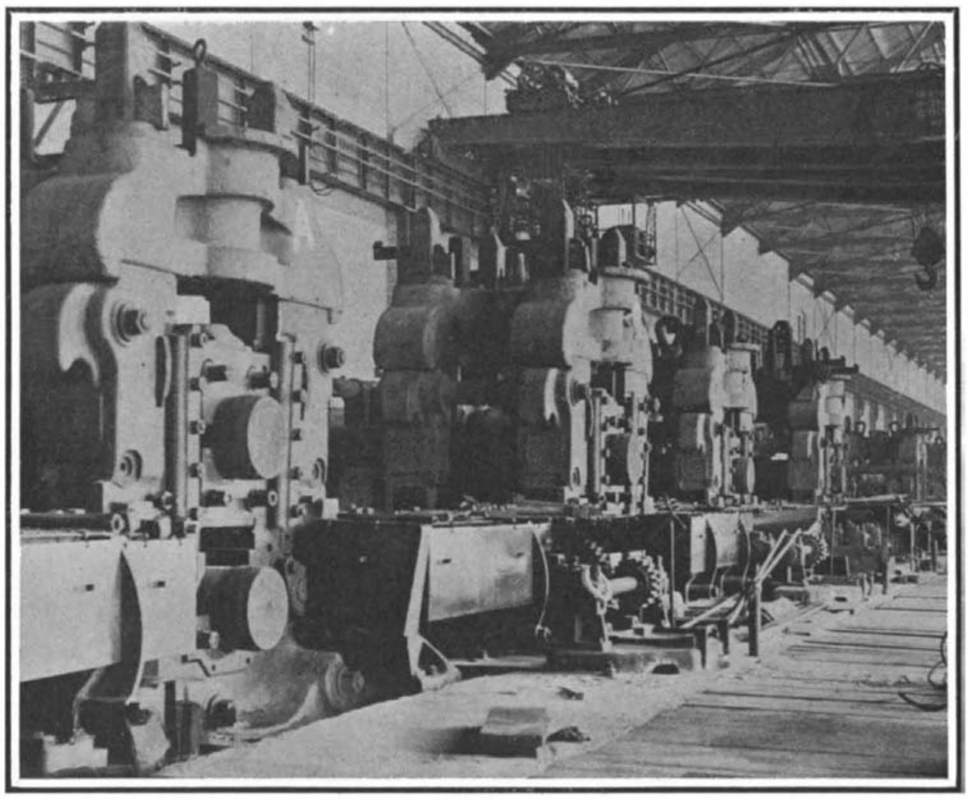
Contains 17 gas engines each of 3,500 horse-power.

Gas-driven 60,000-horse-power electric power plant.



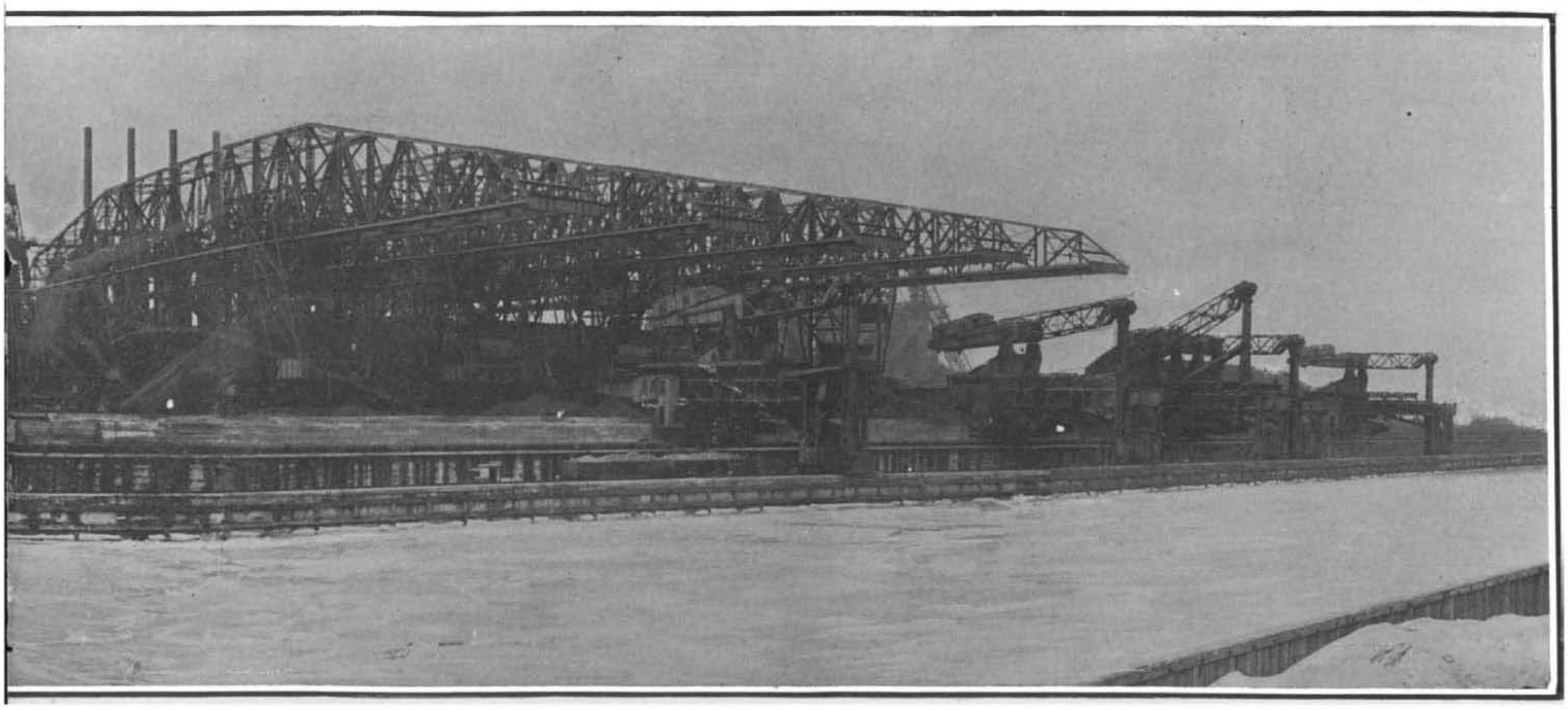
This mill, the largest in the world, can roll 4,000 tons of rails in a single day.

Three-high rolls in the rail mills.



Contains four 40-inch blooming mill stands each driven by a 2,000-horse-power electric motor and a 32-inch mill driven by a 6,000-horse-power motor.

View of the billet mill



Five traveling conveyer bridges for transporting the ore to stock yard and furnaces. Five unloaders for transferring ore from steamers.

LENGTH, WHICH HAS BEEN EXCAVATED FOR THE ADMISSION OF THE LAKE ORE STEAMERS.

SCIENTIFIC AMERICAN

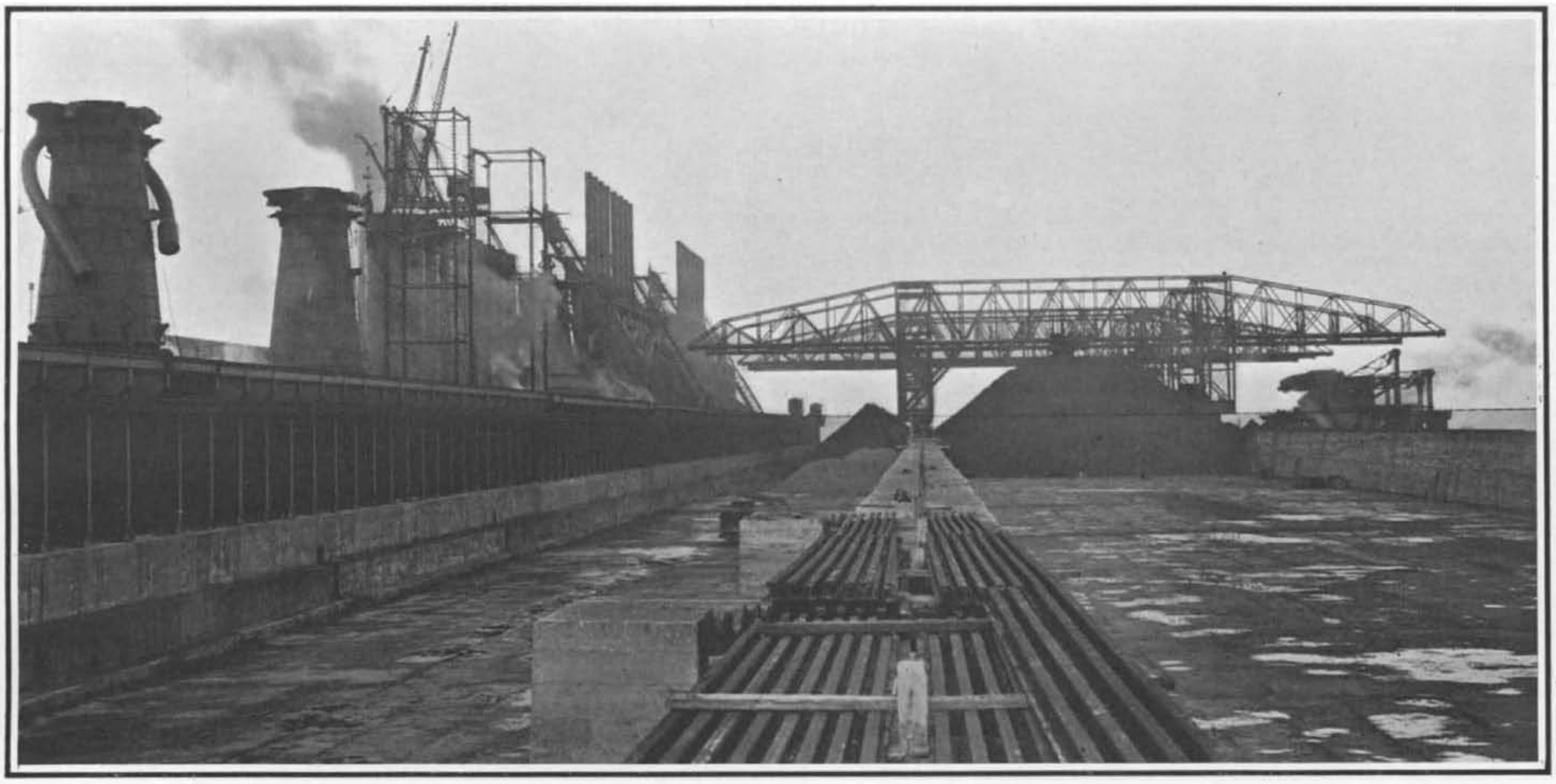
[Entered at the Post Office of New York, N. Y., as Second Class Matter.

A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vol. CI.—No. 24.] ESTABLISHED 1845.

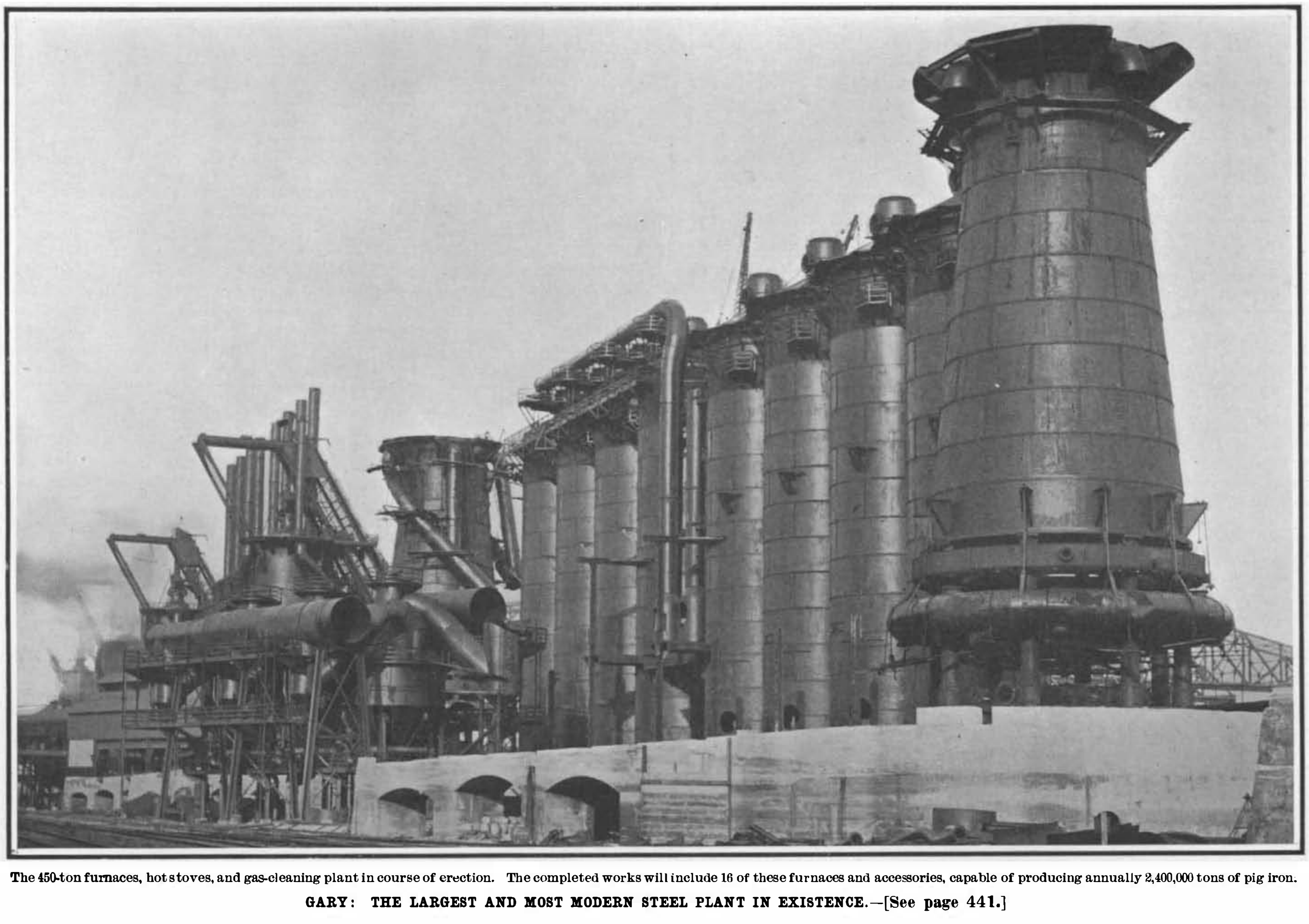
NEW YORK, DECEMBER 11, 1909.

[10 CENTS A COPY $3.00 A YEAR.



This huge concreted basin extends for 4,000 feet parallel with the harbor bulkhead. It is capable of accommodating 5,000,000 tons of iron ore—or sufficient to run the plant during the five winter months.

THE STORAGE YARD INTO WHICH THE ORE IS UNLOADED FROM THE STEAMERS.



The 450-ton furnaces, hot stoves, and gas-cleaning plant in course of erection. The completed works will include 16 of these furnaces and accessories, capable of producing annually 2,400,000 tons of pig iron.

GARY: THE LARGEST AND MOST MODERN STEEL PLANT IN EXISTENCE.—[See page 441.]