

Modern 500 Ton Brier Hill Blast Furnace

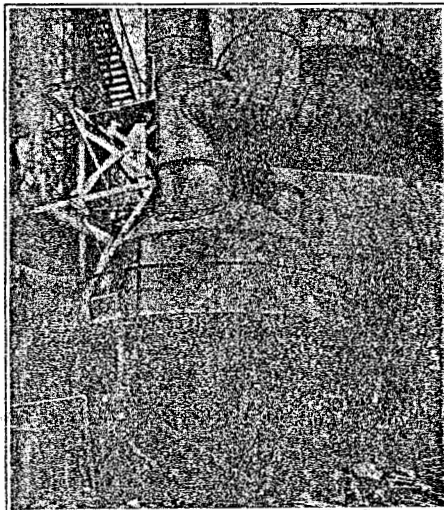
Furnace Built and Placed in Operation Without Shutting Down Previous Units—Description of New Stack and Auxiliary Equipment—New Geesman Gas Washer—Section of Furnace.

On September 21, 1918, the Brier Hill Steel Company, at Youngstown, Ohio, "blew in" their new No. 3, 500-ton stack. The furnace is of modern design in every particular. The foundation, which rests on bed rock, consists of a concrete block 42 feet in diameter, and over 16 feet thick. Several courses of brick on top of this concrete block support the heavy cast-iron base plate, 33 feet in diameter, on which rest six cast-iron columns, 30 inches in diameter. These columns support a mantel, 30 feet 6 inches in diameter, composed of heavy steel angles and plates. The shell proper of the furnace stack, rests on this mantel. It is over 30 feet in diameter at the bottom and tapers to suit the lines of the furnace.

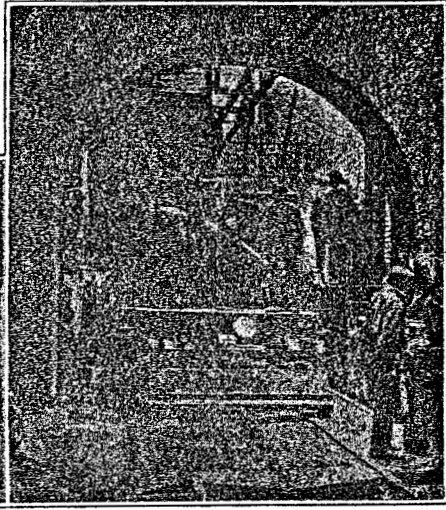
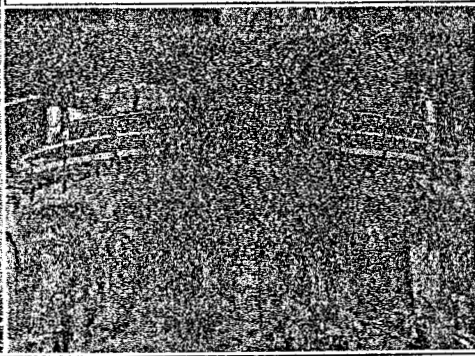
The hearth, 17 feet in diameter, is enclosed by a cast-steel jacket 5 inches thick, over 10 feet high, and 26 feet in diameter, held in place with steel bands and cooled by cast-iron cooling plates laid against the inside surface. The tuyere jacket is made of steel

plate $1\frac{1}{4}$ inches thick, with holes cut in it for inserting copper bosh plates and 12 tuyeres. There are 12 rows of bosh plates extending just below a mantel. A combination water supply and waste trough, supported at the level of the mantel, supplies cooling water to the bosh and collects the discharge from it. This trough has two main inlet and two main discharge connections. All feed and discharge pipes are readily accessible from a platform built on the bustle pipe, with handrail and stairs to the furnace floor. The bustle pipe supplies highly heated air to the tuyeres. It is 40 feet in diameter and is hung from the furnace columns by heavy rods. The mud gun crane and holding device, furnished by Edgar Brosius Company allows the tapping hole to be stopped without taking the wind off the furnace. It is operated at a distance from the tapping hole, thus doing away with any chances of burning the operator.

The cast house is 60 feet wide by 150 feet long, by



The dust catcher is 24 ft. in diameter with dome top and explosion valve. Stock is mechanically discharged from bins with roller gates into heavy cars mounted on scales.

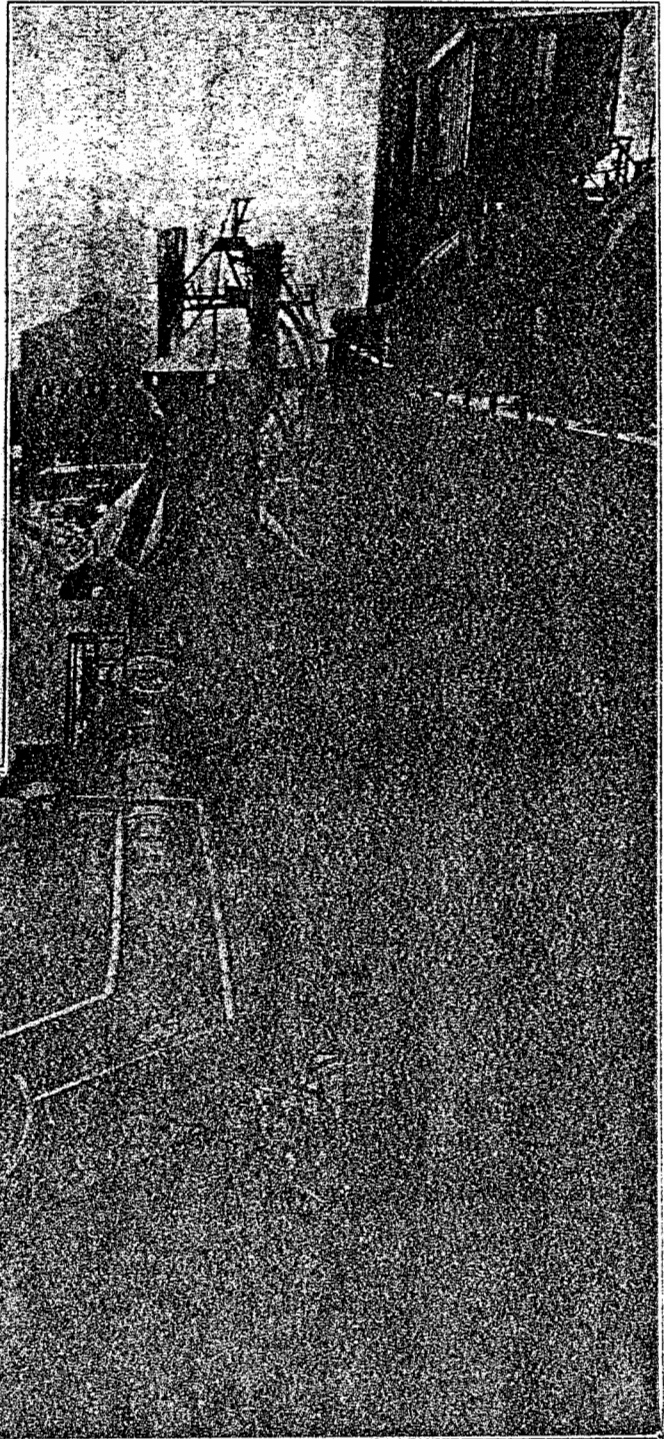


30 feet high, with a steep roof made of steel plates $\frac{1}{4}$ -inch thick, and with sides of No. 18 gauge corrugated steel sheets. It contains a 10-ton overhead crane. No part of the house connects to the furnace shell. Extra large ventilators take away any gases that might otherwise accumulate. All enclosing walls are of concrete with a rigid hand railing their entire length. The track for receiving the hot metal has a length inside of the building sufficient for a train of four inches with a capacity of 45 tons each. The furnace top is of the well known McKee revolving type with double skip. In this top the stock is discharged from skip car to a small bell which is automatically revolved by an electric motor so that each "round" enters the furnace at successive 60 degree points of the circumference.

Gas System.

The gas is conducted from the top of the furnace through four down-comer outlets of low type, with deflector plates, to prevent the escape of coke and heavy flue dirt. Above one of these outlets is an explosion or bleeder valve. The four down-comer outlets combine into two main pipes which enter the dust catcher tangentially. The dust catcher, 24 feet in diameter, has a dome top on which is mounted an explosion valve, and a cone bottom, from which the flue dust can be discharged, either into a railroad car or into the flue dirt trench. From the dust catcher, the gas passes to a steel plate gas washer, 18 feet in diameter by 40 feet high, of a combination spray and impact type, entering at the cone-shaped bottom and leaving at the cone-shaped top, from which

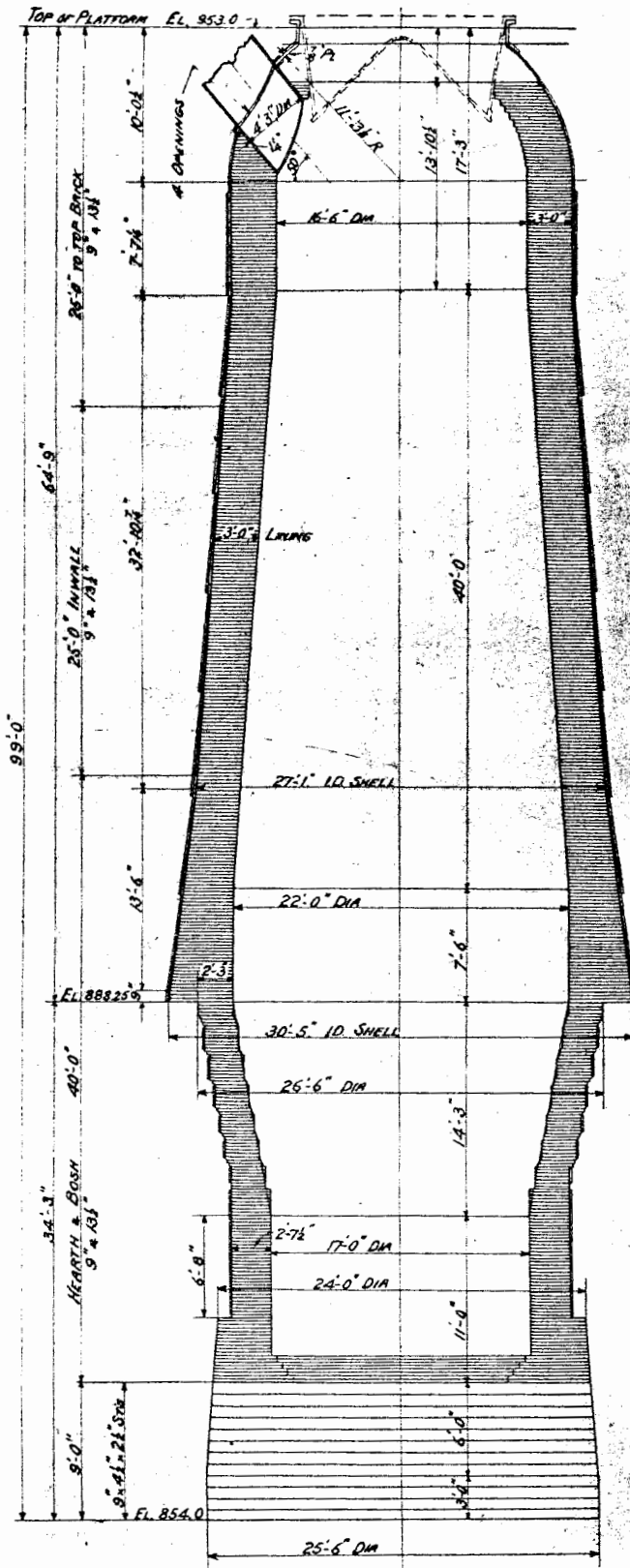
it is conducted to the bottom of the gas dryer, 18 feet in diameter by 27 feet high. The gas leaves the top of this dryer and passes to a special water sealed gas valve of new design and from there to the boilers and stoves. All the water from the openings of gas washer, dryer and valve is sewered into a large flue dust pit or sedimentation basin, which removes all trace of solid matter before the water is discharged into the river.



Gas cleaning apparatus and stoves. A one-ton electric elevator provides convenient means for the workmen to reach the top and make inspections.

The air of the furnace is pre-heated in three hot blast stoves, 23 feet in diameter by 105 feet high of side combustion, two pass type, filled with checker work made of standard size brick. Each stove is pro-

vided with one gas burner, one cold blast connection, one hot blast valve, with special device for changing valves and seats, and two chimney valves, which take the waste gases to the underground flue connecting with a centrally located brick lined stack 200 feet high. The blowoff pipe, which is used for relieving the pressure inside the stove before the gas is turned on, connects into the chimney flue, thus doing away with the noise usually accompanying this operation. The stove floor is 7 feet above yard level, and the chimney flue is built in this foundation above yard level so that it can never be flooded with water. There is a spacious platform at the top of the stoves connecting to the furnace stack with a bridge. A one-ton electric elevator from the stove floor to top platform provides convenient means for the workmen to reach the top and make inspections. A stairway around the elevator shaft can be used in case of accident to the elevator.



Section of stack showing main dimensions.

Hoisting and Charging.

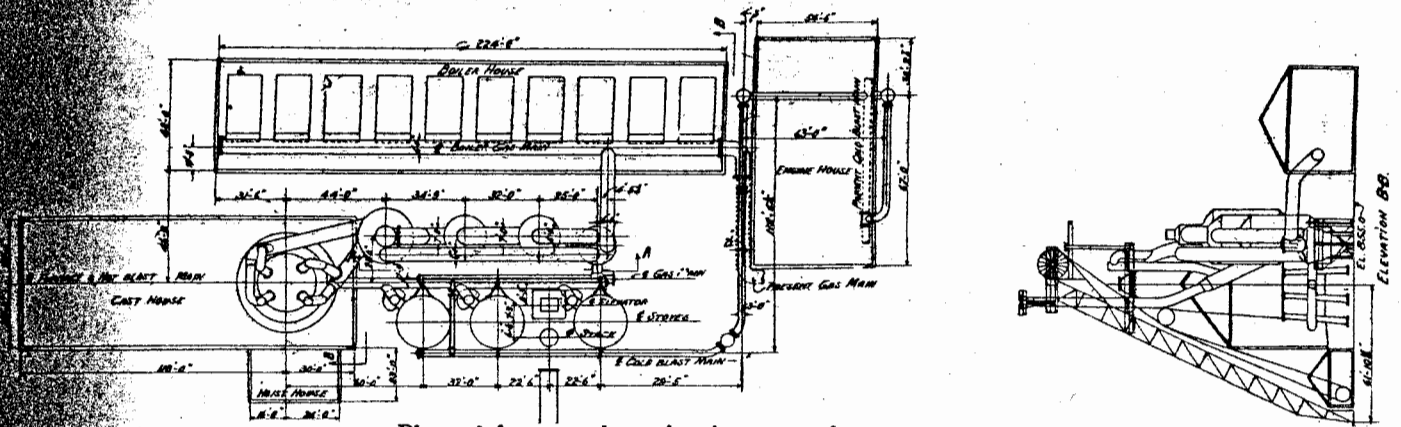
The hoist house, a lean-to between the skip bridge and cast house, is 26 feet wide by 40 feet long with a roof of 1/4-inch thick steel plates, the under side of which is ceiled with tongue and groove wood sheathing. The walls are of brick, and special attention has been paid to illumination. In it is housed the Otis double drum skip hoist, driven by 200 hp 220 volt direct current motor. The hoist is started by an operator, and automatically accelerates, slows down and stops. In the hoist house also are placed the panels by which the revolving top is automatically controlled from the skip motor.

Blowing Equipment.

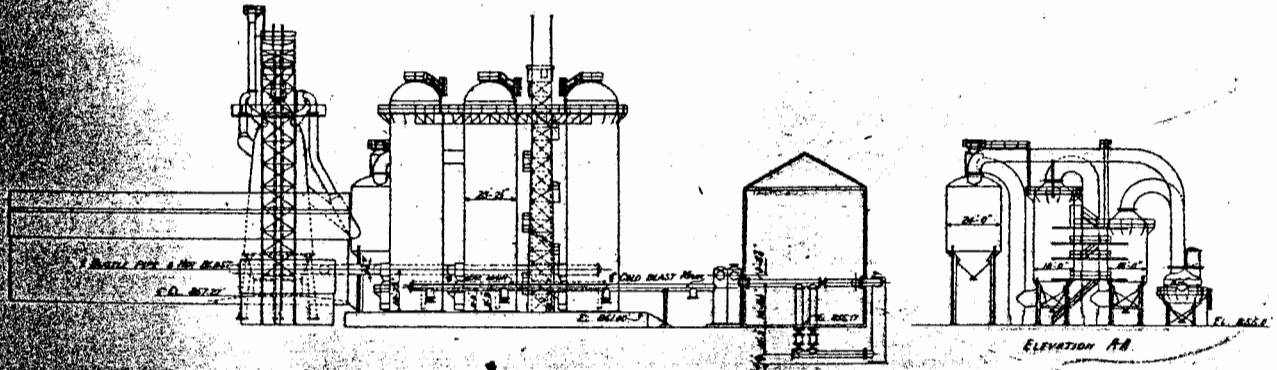
Blast is furnished by two Ingersoll-Rand Company turbo blowers with capacity of 50,000 cubic feet per minute, each, equipped with barometric condensers, vacuum, and circulating pumps, furnished by the same company. The turbo blowers are so well balanced that they are not bolted to the foundation and show no perceptible vibration when running at 3,000 revolutions per minute. These two machines, together with an old Tod engine, form the blowing equipment for both Grace furnace and the new stack. A novel hood surrounded by heavy copper screen and placed on air intake pipe above the engine house roof, keeps foreign matter out of the air intake. It was designed to cut down the velocity head of the incoming air. It has a walk around it, readily reached from the ground by a safety ladder.

Water Supply, Etc.

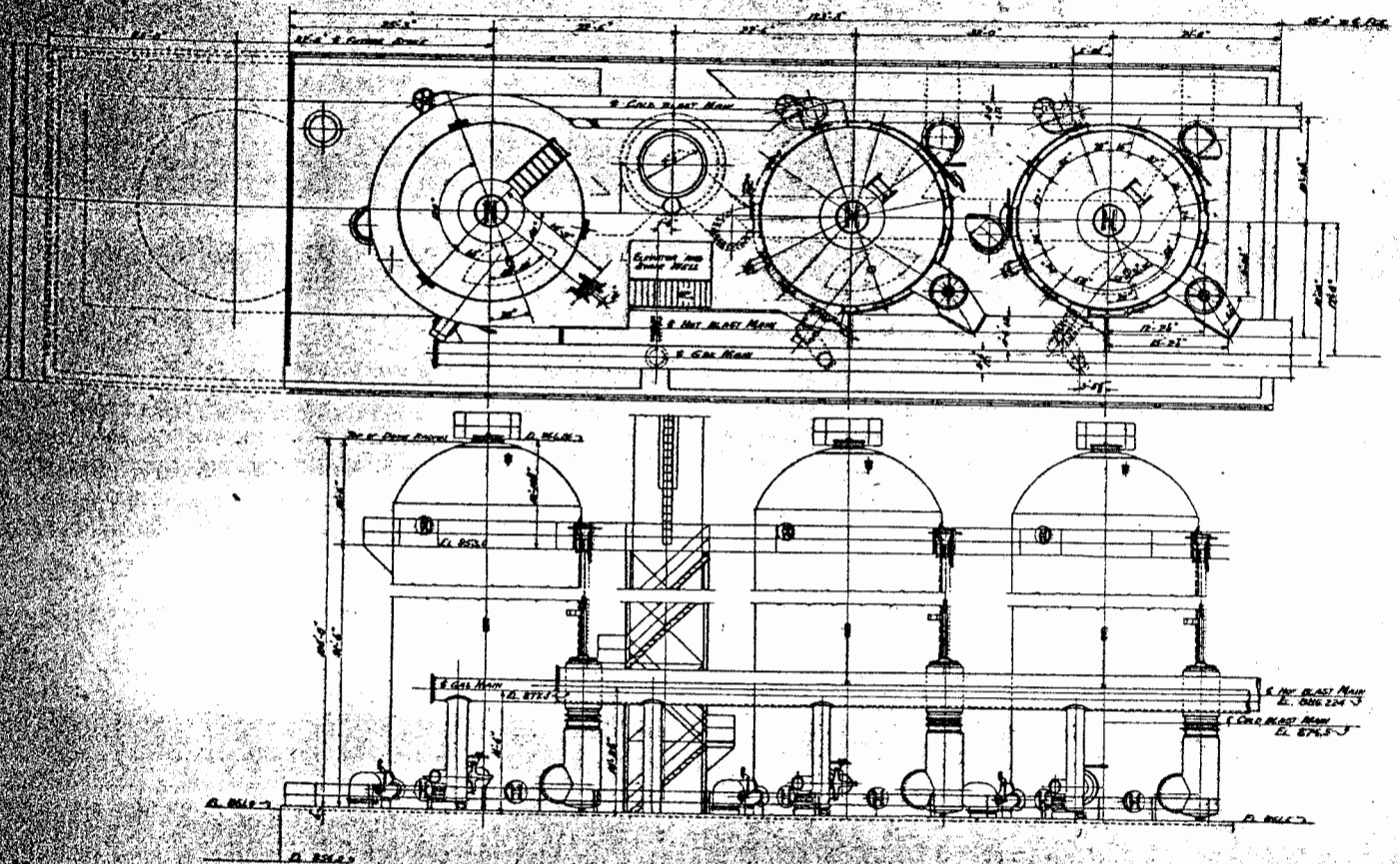
A heavy waterproof concrete tunnel under the Pennsylvania, B. & O. and Erie tracks, connects the pump house on the river bank with the basement of



Plan of furnace plant showing general arrangement.



Elevation of furnace plant.



Hot blast stoves, two-pass type. Each stove is provided with one gas burner, one cold blast connection, one hot blast valve, with a special device for changing valves and seats.

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 ing engine house. Through it are run water sup-
 pipes, circulating water lines to condensers, steam
 to circulating pumps, and exhaust steam lines
 to feed water heater. This tunnel also
 as a subway for use of employes.

er Plant.
 he old boiler plant was torn down and a new
 irected. It consists of seven 700 hp Stirling boil-
 which furnish steam at 200 lbs. pressure and 100
 es superheat. The loop system of steam and
 water piping is used, so that no ordinary acci-



gates which discharge stock mechanically into elec-
 trically driven larry cars.

AT
 an put out of commission more than two boilers.
 e steam generating plants of the works are
 connected, resulting in a great saving of fuel.
 e boilers are fired entirely by blast furnace gas
 h burners of special design which give prac-
 ically perfect combustion. They are thoroughly
 ed with recording instruments so that a record
 THE efficiency of each boiler is available at all times.
 is a subject to which the company has given
 attention for several years. Boilers are set
 with individual stacks 200 feet high. Water
 boilers is pumped from the condenser hot wells
 Scaife We-Fu-Go plant, where it is treated
 ally and filtered. It is then pumped to a 15,000
 ed water heater where the temperature is in-
 d to 210 degrees. It is then supplied to the

boilers by either of two centrifugal pumps in which
 the pressure is automatically controlled.

Ore Handling Equipment.

A large receiving yard has been built to take the
 train loads of ore from the various railroads. It is
 then switched by the company's own locomotives to
 a Wellman-Seaver-Morgan car dumper, which turns
 the car upside down and dumps the ore directly into
 the ore yard. The car dumper has a capacity of 30 cars
 per hour. The ore yard is 200 feet wide and has a
 capacity of over 500,000 tons, which may, in the future,
 be doubled. The sides of the yard consist of massive
 concrete walls 30 feet high, on top of which travels
 Hoover & Mason ore bridge, equipped with 15-ton
 grab bucket which deposits ore into a 100-ton bin
 built on one end of the bridge. The bridge trucks
 are anchored by ropes run from drums and fastened
 to the ends of the concrete wall. This keeps it from
 running away during high wind storms. From the
 100-ton bin at the end of the bridge the ore is dis-
 charged through electrically operated gates into either
 of two 60-ton transfer cars, motor driven, and equipped
 with airbrakes and side discharge operated by air.
 These transfer cars travel on standard gauge track
 and fill the bins of all three furnaces. The bin system
 of the new furnace consists of 10 double compartment
 structural steel Hoover & Mason bins, each com-
 partment fitted at the bottom with two roller gates
 for discharging the stock mechanically into either of
 two larry cars, running on a standard gauge track
 underneath the bins. These larry cars are mounted
 on scales with automatic dials. They are electrically
 driven and equipped with airbrakes and airdump for
 discharging the ore into either of the skip cars, where
 it is taken to the top of the furnace, as previously out-
 lined. The skip pit is built of heavy waterproof con-
 crete with reinforced concrete platforms around the
 cars, and concrete stairways, thus affording easy
 means of cleaning the pit.

Eighty-four and 132-inch Plate Mills.

The Brier Hill Steel Company has recently com-
 pleted the construction of two plate mills. Both mills
 are under one roof. The mill building is reputed to
 be the largest in the world. Particular attention has
 been paid in the design to give the capacity of heat-
 ing, finishing and shipping, equal to the full capacity
 of the rolls. It is in this feature that the arrange-
 ment is superior to all others. Both mills, one 84-
 inch and the other 132-inch, are driven by electric
 motors with power furnished by the Republic Rail-
 way and Light Company, and should be particularly
 free from smoke and dirt. The boiler plant has been
 dispensed with, as the only steam needed will be used
 for heating the substation and motor rooms, and pos-
 sibly for blowing scale from the steel. This steam is
 furnished through an underground conduit from the

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