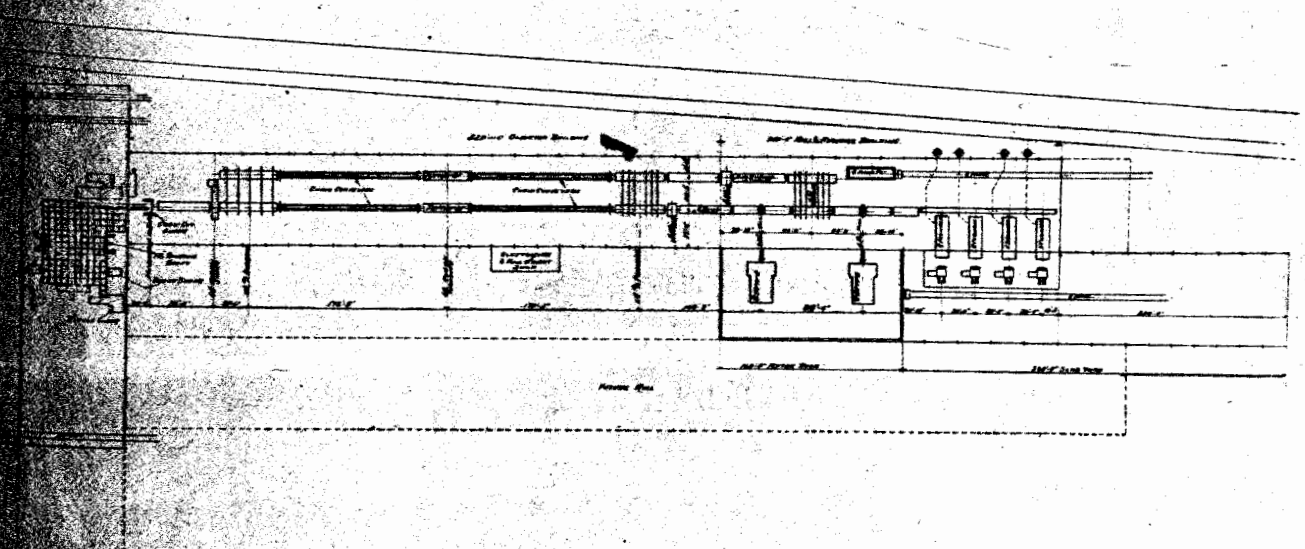
The Blast Furnace and Steel Plant
6 (1918)

Youngstown Sheet and Tube Plate Mill

Tandem Plate Mill Designed to Roll 15,000 Tons of Plates Per Month — Absence of Hydraulic and Steam Machinery and Grouping of Controlling Apparatus Are Distinctive Features.

The following is a general description of the tandem plate mill erected by the Youngstown Sheet & Tube Company, at the East Youngstown plant, and which was put in operation on June 17 of this year. The mill was originally designed to finish a sheared plate 100 inches wide, in lengths up to 50 feet. This mill is designed to roll plates from slabs which are sheared to required sizes by the blooming mills, and to produce an average of 15,000 tons of plates per month. The distinctive features of the mill are the absence of hydraulic and steam machinery, the elimination of all exposed wiring, the grouping of controlling apparatus at a minimum number of points and the double line of cooling tables.



Plan of buildings covering approximately 210,000 square feet—The diagram shows the mill and furnace building, slab yard, motor room, conveyor building and warehouse.

Buildings.

The total floor space occupied by the plate mill buildings are approximately 210,000 square feet. The buildings are as follows:

The mill and furnace building 80 feet wide by 300 feet long (shown at the right of Fig. 1), which houses both the mill and the continuous heating furnaces, and is equipped with a 40-ton crane with 15-ton auxiliary hoist and standard gage track for unloading materials.

The slab yard is 80 feet wide and 340 feet long and is equipped with two 10-ton single hook cranes with magnet drum and standard and narrow gage tracks for handling slabs. This building is built parallel with the mill buildings.

The motor room is 80 feet wide by 160 feet long, with brick walls, and is built parallel with the mill buildings. It houses the two 2,000-hp motors which drive the mills and all control equipment for them, and is equipped with a 20-ton single hook crane and standard gage track.

The conveyor building is 80 feet wide by 520 feet long, and is in line with the mill and furnace building. It houses the conveying machinery, straighteners, turnovers, rotary shear and end-cut shear, and is equipped with a 10-ton single hook crane.

The warehouse is 93 feet wide by 320 feet long and is placed at the end of, and at right angles to, the conveyor building. It houses the trimming shears, circle

shear, castor floor and shipping tracks, and is equipped with two 10-ton cranes with magnet drum.

The buildings are of steel construction and were furnished and erected by the Blaw-Knox Company, of

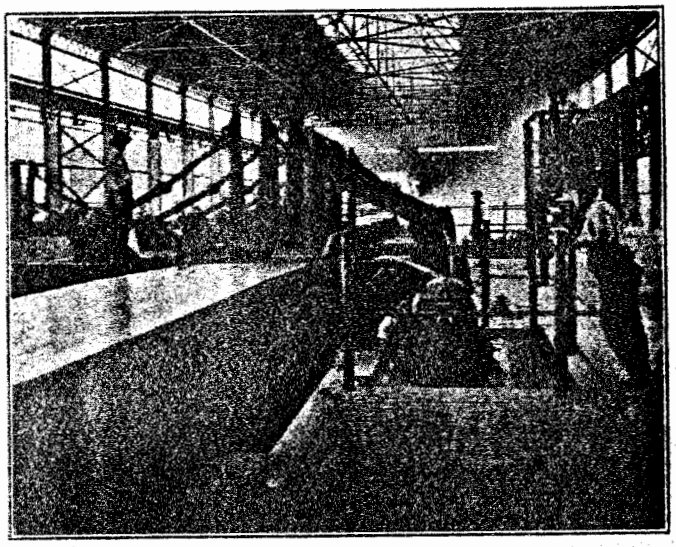


Plate turnover with which any width of plate may be turned over and retain its relative position on the tables, thereby eliminating the pullovers usually necessary.

Pittsburgh, Pa., much study being spent on the lighting and ventilation.

All of the buildings except the slab yard are built with the Pond type inverted monitor roof and equipped with Lupton top-hung sash and operates in the monitor, and with United Steel sash, furnished by the Trussed Concrete Steel Company for the side walls. The side wall sash consists of two runs of continuous sliding sash, each 5 feet high around all buildings, except the motor room, which building, having brick wall, is provided with ample pivoted ventilating sash.

The 40-ton crane in the mill building, and the 20-ton crane in the motor room, are of massive construction and were furnished by the Cleveland Crane & Engineering Company. The 10-ton cranes in the rest of the buildings are extremely high speed and are well adapted to the service which they perform. These cranes were furnished by the V. R. Browning Company.

Furnaces.

There are four Laughlin gravity discharge continuous heating furnaces, 12 feet wide by 45 feet long over all, and are operated on coke oven gas. Each furnace is equipped with an electrically driven slab pusher, built by the United Engineering & Foundry Company. A motor-driven slab table, built by the Morgan Engineering Company, delivers the slabs to the mill tables. The floor around the furnaces is raised to a convenient height for operation by means of retaining walls of concrete, and the permanent fill, which is paved with brick. This feature eliminates the use of all steel or wooden platforms such as are usually used for this purpose.

Roll Stands.

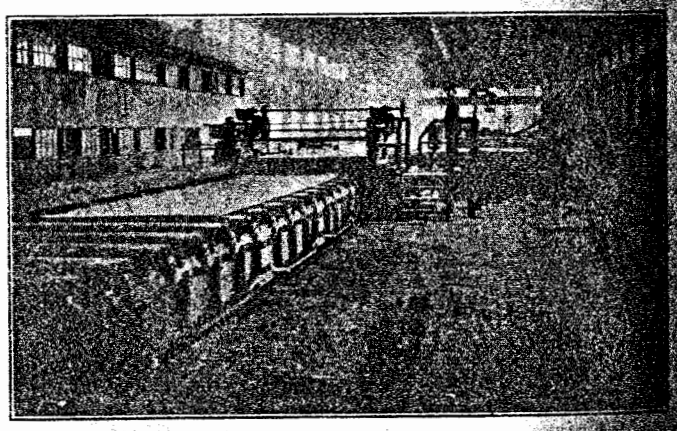
The roughing and finishing are duplicates in all respects, except for a difference of 12 inches in the length of the rolls. They are of the three-high type with 32-inch top and bottom rolls and 22-inch middle rolls, and were furnished complete with tilting tables and pinions by the Mesta Machine Company. The middle roll-lifting mechanism as well as the table-tilting mechanism are electrically operated, in fact, the only hydraulic power used on the entire layout is a constant pressure cylinder for balancing the top roll.

Each mill is driven by a 2,000-hp, 6,600-volt, 25-cycle, 3-phase induction motor, which runs at 81 r. p. m. and is connected by spindles to the middle pinion in the pinion housing. The speed reduction in the pinion housing is as 14 to 20; therefore, the speed of the mill rolls is 56 r. p. m. These motors were furnished by the Allis-Chalmers Manufacturing Company. The mills are of massive construction and of the very latest design in plate mill practice.

The roll stands are located tandem, 88 feet 4 inches apart, and the intervening space is occupied by an intermediate table which also acts as a receiving end for a chain transfer for moving the plates for the second line of tables which, run parallel to the mill tables and at a distance of 28 feet 6 inches apart. These tables were also built by Mesta Machine Company.

Runout Tables, Conveyors and Straighteners.

The plates are straightened by Hilles & Jones plate straightening machines of which there are two, one on each line of tables. The straightener tables were furnished by Treadwell Engineering Company



Straightening rolls.

and are equipped with collared rollers which permit of an air space under the plates to prevent unequal cooling.

The chain conveyors were built by Heyl & Patter-

Company, and are located in front of and beyond the plate turnovers. The conveyors in front of the turnovers being used as cooling tables and those beyond as marking tables. These conveyors are of the roller-chain type, of four strands each. The two transfers in the conveyor building are of the chain pullover type, each pullover being equipped with two dogs, and were furnished by the Treadwell Engineering Company. The first transfer is located 105 feet 5 inches from the center of the 84-inch mill, and the second one 448 feet 5 inches from the same point.

Plate Turnovers.

The two plate turnovers are unique in many respects, being designed to eliminate the inherent defects in the ordinary type. These machines are of a type patented by William Forsstrom, chief engineer of the Youngstown Sheet & Tube Company, and were built by the Treadwell Engineering Company. With these machines any width of plate may be turned over and will retain its relative position on the tables, thereby eliminating the pullovers which are necessary with the ordinary type. A plate may also be lifted to a position convenient for examining the under side and then returned to the table without being turned over. They are much faster than the ordinary type, due to the fact that they make one complete turning operation with the forward stroke and one also with the return.

The plate is turned by a series of forks or cradles which are located between the rollers of the turnover tables. The bottom of the fork is carried in a moving pivot which travels in a parallel line across the table, the upper end of the forks are connected by flexible links to stationary posts on either side of the table, one to each side. The turning action is accomplished

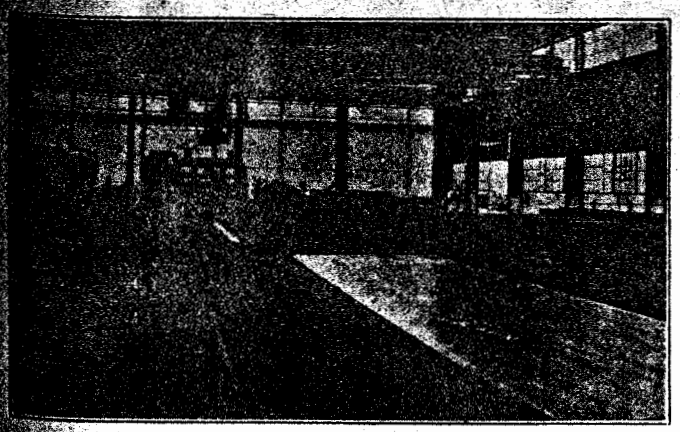
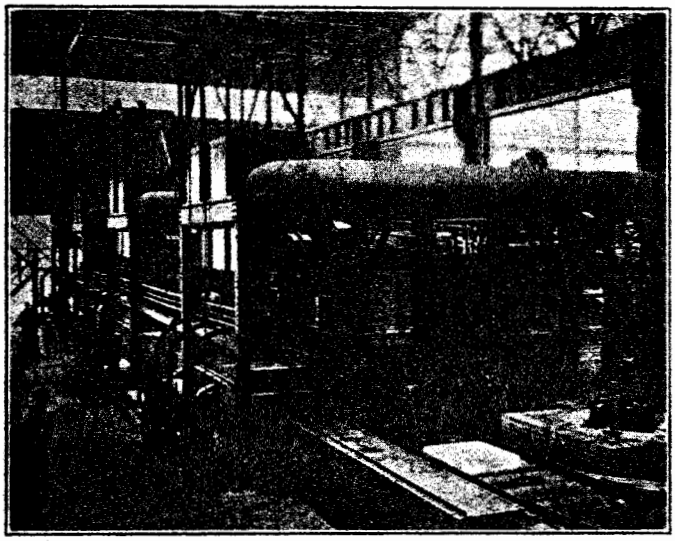


Plate conveyors, double rotary shears, and in the distance end-cut shears.

by moving the pivot which carries the bottom of the fork in a direct line across the table, the travel of the upper ends of the forks being restricted by the links, the fork will turn itself over in its own length, thereby turning the plate which is held therein. This mechanism is moved by rack beams actuated by pinions mounted on a common driving shaft which is in turn driven by a 40-hp electric motor.



Laughlin gravity discharge continuous heating furnaces, 12 feet wide by 45 feet long, operated on coke oven gas.

Shear and Shipping Department.

Ample facilities have been provided for handling the finished product in the shear and shipping end.

All parallel plates up to and including 1-inch thickness will be side trimmed on a Newbold double rotary trimming shear which is located 480 feet from the 84-inch mill and 60 feet in front of the end-cut shear. The table in front of the end-cut shear is provided with a straight edge to facilitate the squaring of all plates which have been side trimmed. The end-cut shear is a Hilles & Jones Company No. 6½ gate shear, 112 inches between housings.

It is provided with a back shear table which was built by the Mesta Machine Company and which is a combined shear runout and scale table. A 40-foot double beam Fairbanks scale is located under this table, with lifting arms which can be raised at will to lift the plates from the table and weigh them. The plates may then be discharged by these same arms onto a plate rack, which is located beside the table, or it may be pulled off onto the castor floor.

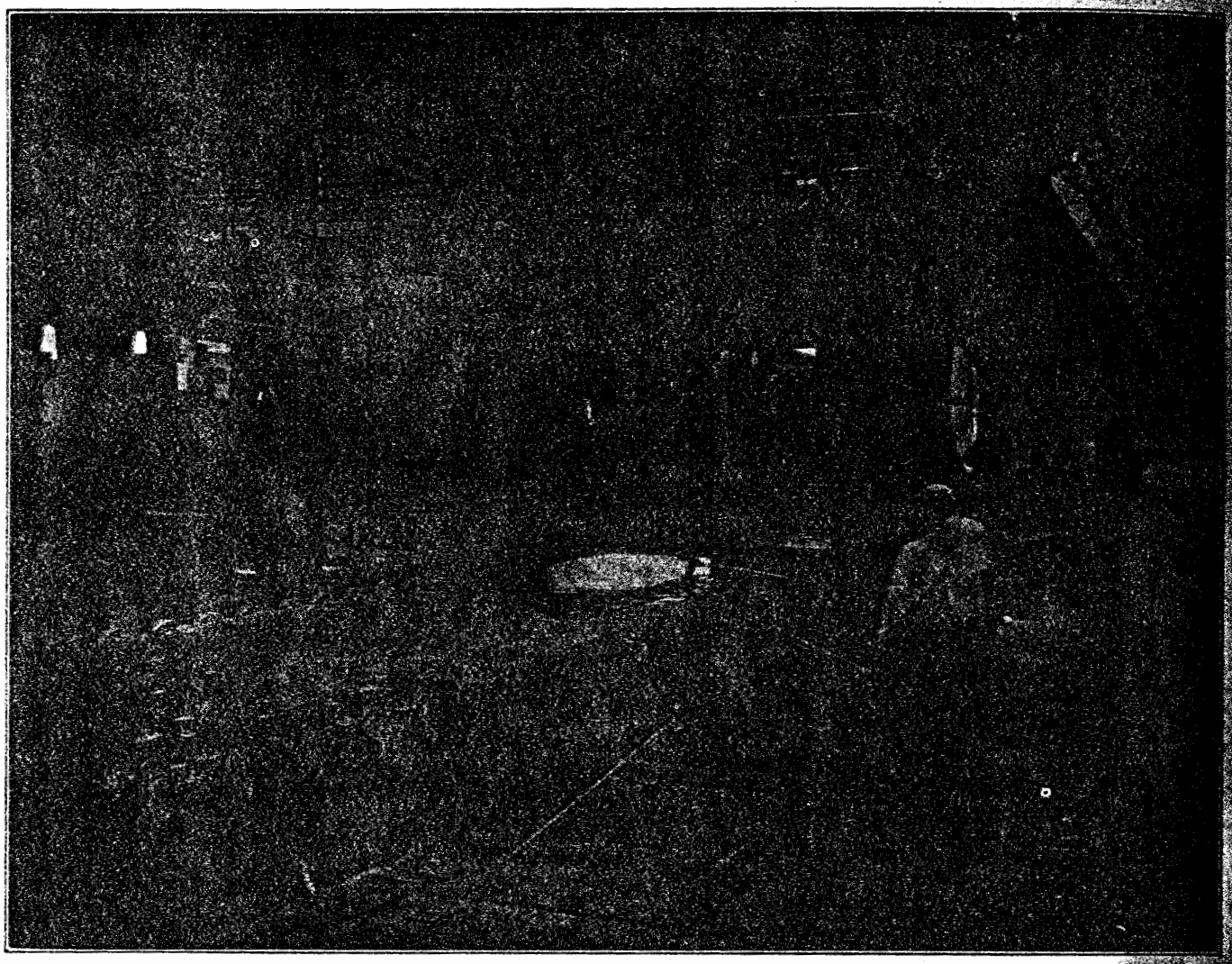
All sketch plates and plates over ¾-inch thickness will be trimmed on two 146-inch Hilles & Jones gate shears which are located, one on either side of the castor floor. A Newbold circle-cutting machine is provided to cut circle and radius plates.

The warehouse is equipped with ample castor floor and two additional plate scales. It is also provided with three depressed shipping tracks, and all plates

are handled by high speed 10-ton cranes provided with equalizer bars on which magnets or hooks may be used.

Electric Power.

The electric power for operating the mill is furnished by the main power plants and delivered by high tension underground system to a sub-station near the plate mill. This sub-station is equipped with three 6,600 to 240-volt General Electric motor generator sets, for providing the power for the DC General Electric type MD motors which drive the mill machinery. The 2,000-hp main mill motors are driven directly from the 6,600-volt system. All control apparatus for these large motors is contained in the motor room. This control apparatus was furnished by the Cutler-Hammer Manufacturing Company and the entire electric system in the motor room is of bus-bar construction. The power for the direct-current motors used on the mill machinery is delivered from the sub-station to four centralized stations in which all of the control apparatus for the entire mill is grouped. These four main leads comprise all of the exposed power wiring in the plant, as all of the wiring from the control houses to the machinery and to the pulpit is carried in underground conduit imbedded in the concrete. This system eliminates all unsightly wiring and is vastly superior to any other from a safety viewpoint. Con-



Showing the two roll stands which are duplicates with the exception of a difference of 12 inches in the length of rolls—The only hydraulic power used is a constant pressure cylinder for balancing the top roll—The entering side of the roughing mill is shown in the foreground.

trol apparatus was designed and furnished by the Electric Controller & Manufacturing Company.

A well-equipped mill office and millwrights' and electricians' shops have been built adjacent to the mill buildings, and all sanitary equipment, wash rooms and locker rooms are of ample size, well equipped and conveniently located. All engineering work on this installation was done by the engineering department of the Youngstown Sheet & Tube Company.