The Blast Furnace and Steel Plant

51 (1917)

Uniflow Steam Engine for Rod Mill Drive

Nordberg Uniflow Used as Drive for Roughing Stands on Continuous Rod Mill at Youngstown Sheet & Tube Company's Struthers Plant—Electric Drive on Finishers.

By CHARLES C. LYNDE.

One of the large extensions of the Youngstown Sheet & Tube Company which was authorized last year, and on which construction was at once begun, is the new merchant mill plant at the Struthers, Ohio, plant, of the Youngstown Sheet & Tube Company. This plant is laid out in two sections, one section a nine-inch mill, and the other caring for a twelve-inch unit. At an angle to the main sections covering the mills proper, and across the end, is a building for handling the incoming stock, and arranged to give

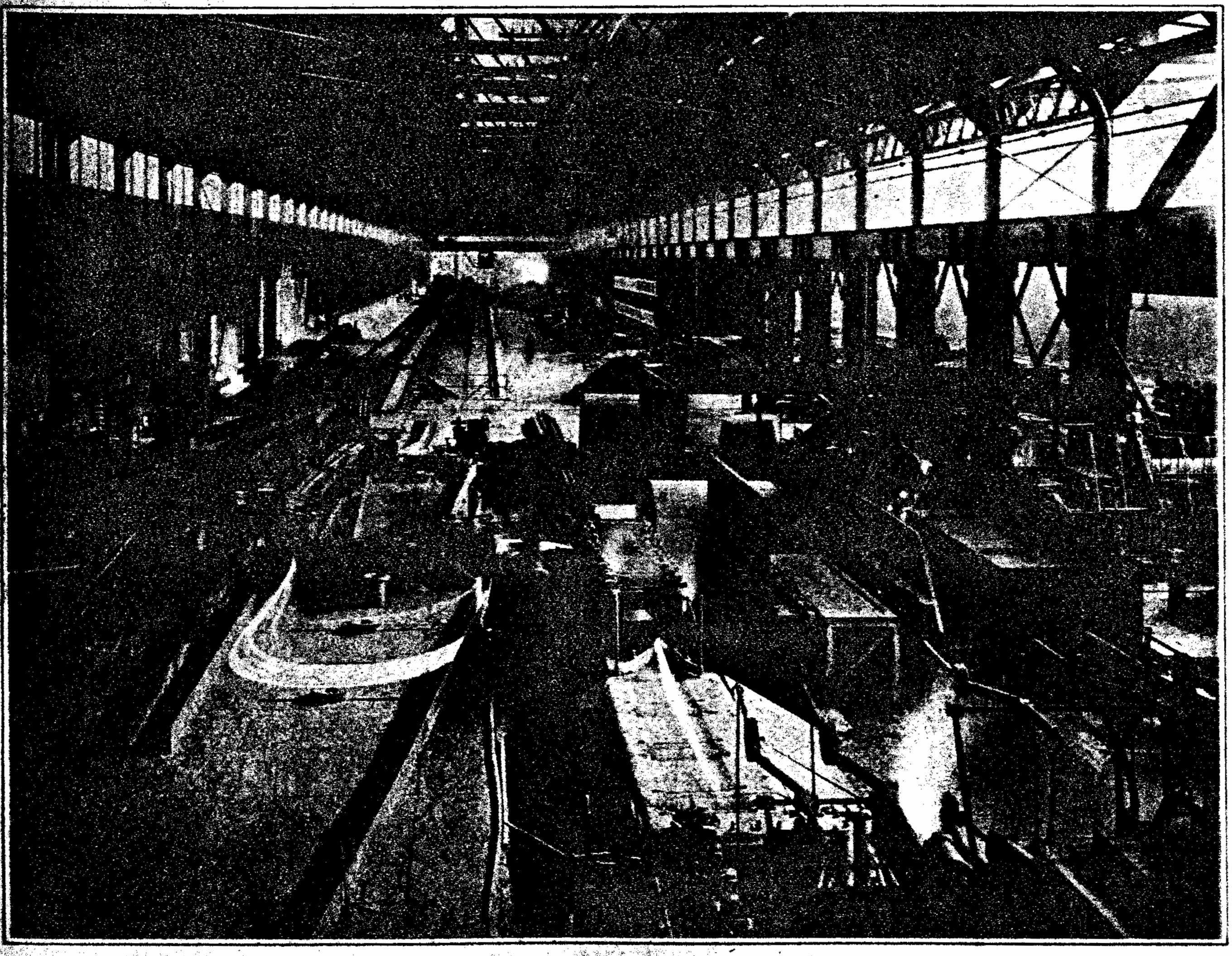


Figure 1.—General view of the nine-inch side of the new rod mill with looping strand in the foreground—Compact arrangement of all units here appears—At the right of the main floor beside the cooling bed appear piles of brick and other materials assembled for completing work in t he twelve-inch mill alongside.

unloading service for the bars as they come in from the company's other plants. Here an overhead crane unloads the bars from the railroad cars and stores them on a platform to await transportation to the feed side of the heating furnaces serving the mills. The stock is carried on a roller table and mechanically charged, its progress through the inclined bed of the furnace being due to the charging of new material and the withdrawal of the heated stock as it goes to the rolls. At the other end of the plant is a

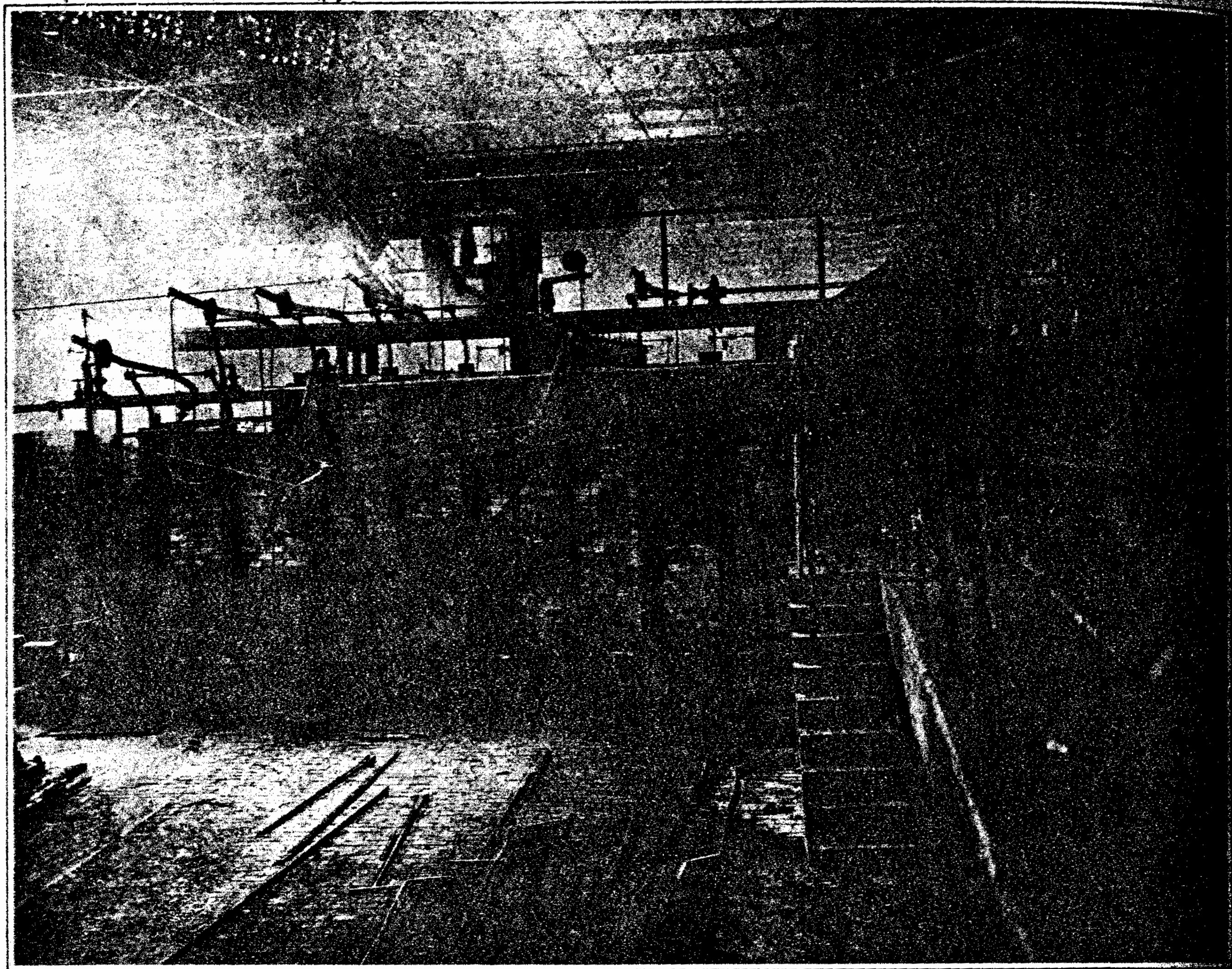


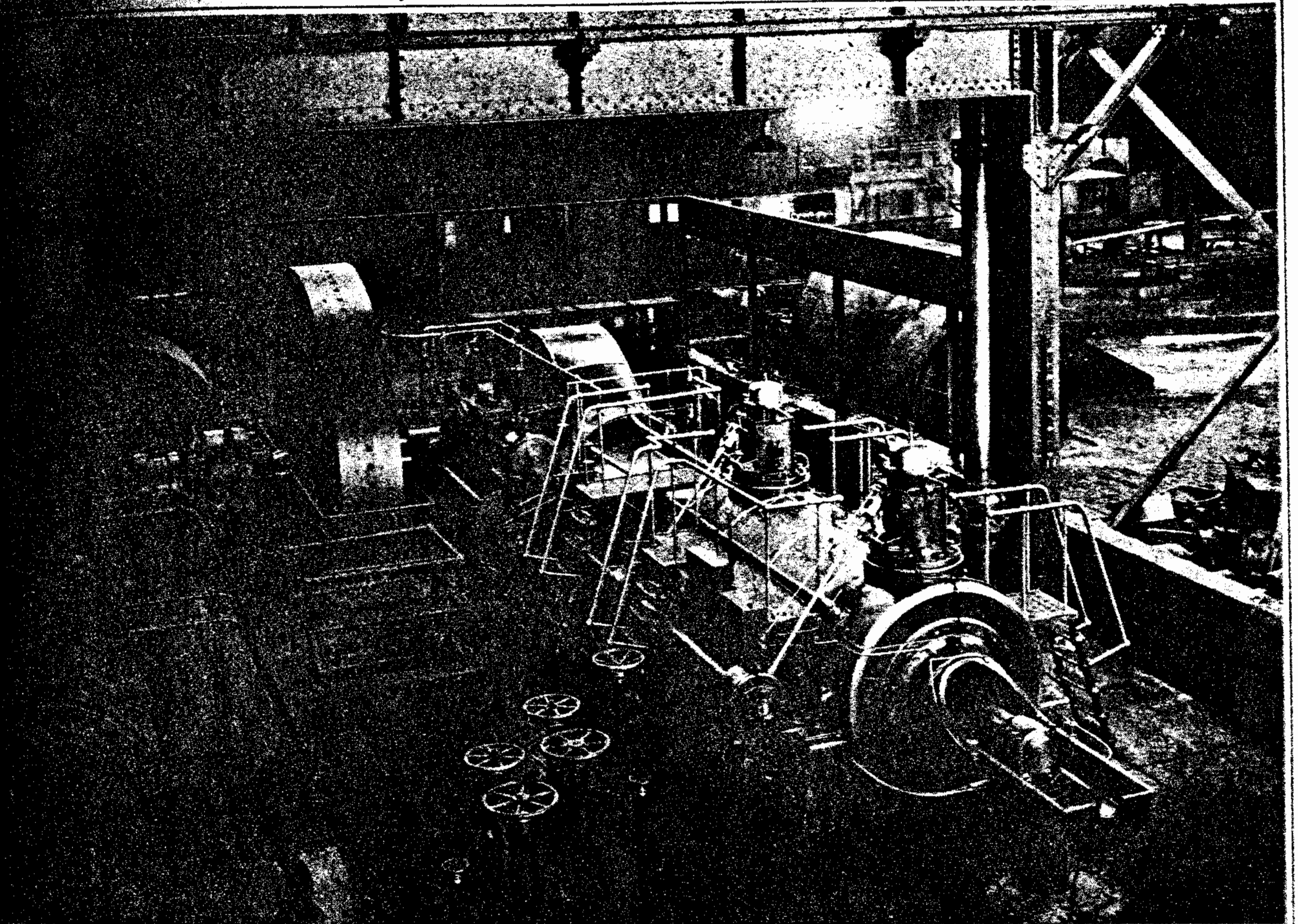
Figure 4.—Charging side of nine-inch mill heating furnace, wherein may be seen some of the permanent features [illegible] the plant and the care for safety provisions.

similar diagonal building, housing the cranes for loading the rod or other finished product from either mill onto railroad cars for re-shipment to some of the using departments of the plant, or for freighting direct when the plant has completed its working of the material.

The nine-inch mill is in a building 90 x 1,150 feet in extent, and the twelve-inch in a section 100 x 1,200 feet. The building is of the usual structural steel type, with a Pond type roof.

Drive for the nine-inch mill is a combination of steam and electricity. The roughing stands [illegible] nine-inch mill are driven by a single cylinder [illegible] berg uniflow engine, 37 x 48 in., connected to [illegible] roughing stands through a progressive bevel [illegible] drive. The gearing on these roughing stands is [illegible] as to give an approximate speeding up of the [illegible] secutive stands so as to absorb the major portion [illegible] the elongation of the stock as it is formed. The [illegible] tire mill consists of six stands of twelve-inch roughing and six of nine-inch finishing, and one Edwards [illegible] ing mill. The two finishing stands, No. 7 and [illegible] are driven by a 700-horsepower Crocker-Wheeler [illegible] rect-current motor, while the Nos. 9 and 10 and [illegible] 11 and 12 stands are driven by 600-horsepower [illegible] Crocker-Wheeler motors. A 100-horsepower [illegible] current motor, Crocker-Wheeler, drives the Ed[illegible] sizing mill.

The twelve-inch unit is as yet not complete[illegible] stalled, but when put in will be driven by a 44 x [illegible] Nordberg uniflow engine. The normal capacity [illegible] average sections will be 10,000 tons per month.



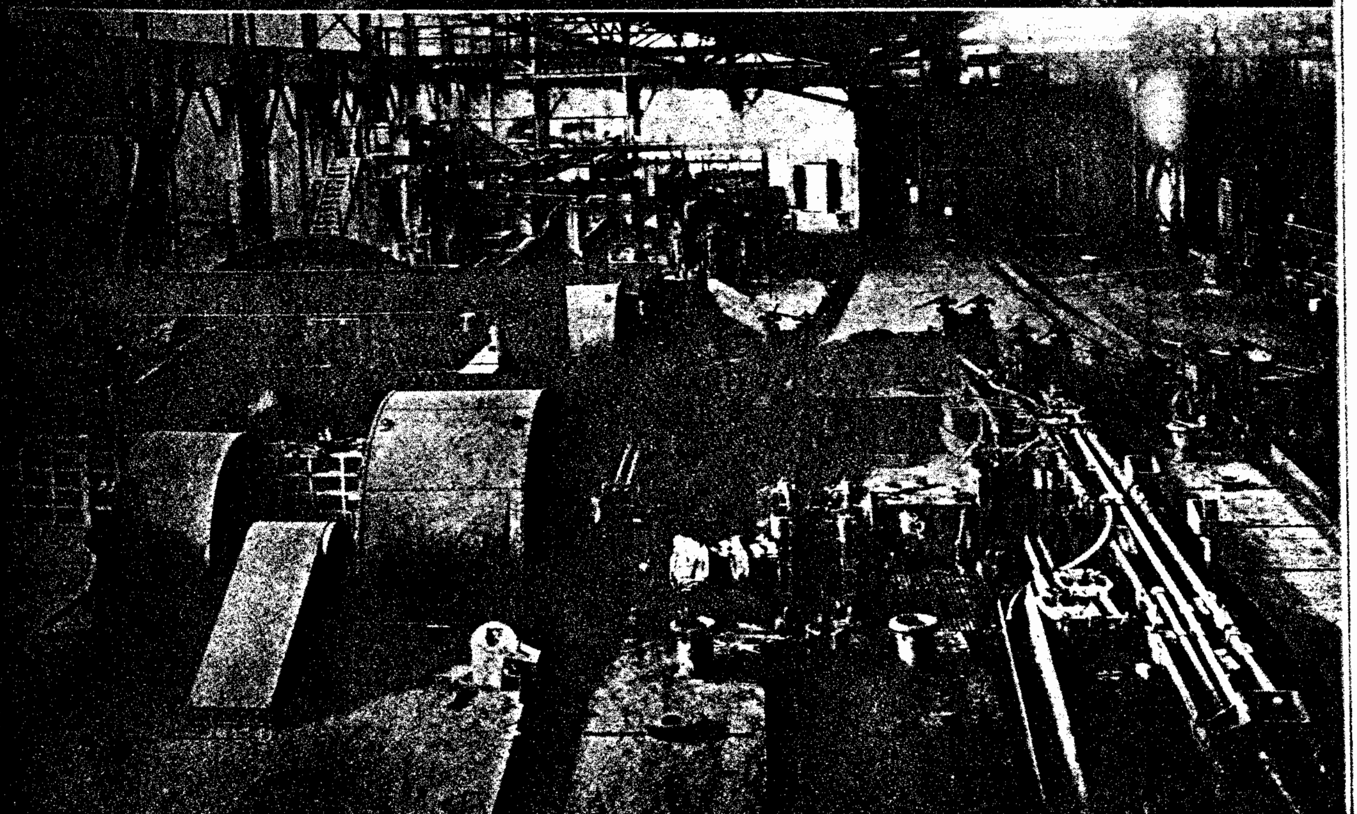


Figure 2—View of Nordberg unit, showing general location with respect to mill—Note governor drive and safety shaft feature—Figure 3 (below) Engine, mill, and one of d. c. motors for driving finishing stands—In the central foreground appears the underground provision for looping of the metal during drawing.

The general layout of the nine-inch mill is shown in Figure 1. The last four roughing stands are shown with a bar entering, while the same piece is shown on the looping floor passing through Nos. 7 and 8 stands. The motors driving the finishing stands are shown covered with sheet steel hoods, for their better protection against dirt and flying cobbles. At the right of the roughing stands is the steel cover housing the reduction bevel gears driving the roughing stands, each connected to the engine shaft.

The general arrangement of the Nordberg engine is shown in Figure 2. At the extreme left of the view is the partially-erected 44 x 50 in. uniflow unit for the twelve-inch mill, whose final drive will be away from the nine-inch stands and toward the photographer. At the extreme left of the picture can be seen the 700-horsepower C-W motor driving No. 7 and No. 8 stands.

The governor drive on this engine consists of the lay shaft shown between the flywheel and the engine proper, driven from the crank shaft by a spiral bevel drive. At the end of the shaft is carried a steel disk, and directly over this disk a similar one on the governor shaft. Drive is transmitted between these disks by a friction member, consisting of four fibre-faced wheels, running in pairs on opposite sides of the two disks. These wheels are keyed to two shafts and are a fixed distance apart. Then, to regulate the governing speed of the engine, it is necessary only to vary the position of this drive unit so as to vary the revolution ratio of the two disks. The governor is of the balanced fly-ball type, actuating the cut-off release rod through a dash-pot control. The governor is very sensitive, taking the load almost instantly as the heated bar enters the first roughing stand, and building up perfectly to carry the increase as the additional stands take up their share of the reduction. As the bar passes through the roll stands and the load diminishes the governor acts quickly to reduce the steam admitted and thus to slow the engine.

Oiling of the engine is secured through a force-feed system, all oil draining back to a filter and being purified before being sent through the oil mains again. A Richardson-Phenix unit is installed, and the lubrication of the engine taken care of through the filters in connection therewith. The oil leads on the engine may be seen from inspection of the view in Figure 2.

The mill view of the engine is given in Figure 3, which also shows the 600-horsepower motor housing for the Nos. 11 and 12 finishing stand drive. The engine is protected against accidental damage from crane loads by the structural steel erected on the mill sides, while the lower part of the partition is utilized as a place for the series of bins erected to hold the bolts, spares and other small parts required around the plant.

In the center of the foreground appears an interesting method adopted for eliminating a part of the looping of the red-hot metal on the floor. Between certain passes the strip is shunted down the chute in the foreground, and allowed to take care of its extension in the space provided under the floor.

This same view shows the pipe leads used to convey the rods from the finishing stand to the Edwards pouring reels, four in number, which are arranged at the end of the annealing bundle conveyor. The mills, furnaces, cooling tables, and other equipment pertaining directly to the mill, are all from the Morgan Construction Company, Worcester, Mass., while the crane service is from the Cleveland Crane & Engineering Company.

Some of the safety features, as well as the permanence built into this unit of the sheet and [illegible] plant, may be found in Figure 4, showing the bar heating furnace for the nine-inch mill. The steps at the right are monolithic concrete, and a unit with the platform to which they lead. Along the edge of the walk are set heavy pipe posts, carrying the two safety chains which guard the edge. The power driven furnace charger is shown at the right of the view, with a bar in transit. The fan system providing furnace draft is located above the furnace, and platforms around this unit are provided with toe boards and rails—as are all such exposed walks in this building.

The nine-inch mill, equipped with reels and a cooling bed, is able to turn out a large variety of shapes and types of rods, either to fill needs within the plant for its own manufacture, or according to specifications from the outside. Either bed or reels can be used as desired, with no change in set-up.

A Reply to Mr. H. G. Geissinger's Discussion

To the Editor, **The Blast Furnace and Steel Plant:**

The writer has studied with much interest the discussion of Mr. Geissinger of the curves for the flow of gases through standard orifices. He cannot agree with him that his method of plotting the curves is simpler, because, in the derivation of Mr. Geissinger's equation it is necessary to solve the fundamental equation for flow in order to determine some of the constants.

The derivation of the general simplified formula to apply to any gas is not based on the theory of the flow of elastic fluids and the writer feels that, in general, if rigid analysis will give the required results the empirical equations should not be used.

The statement that the simplified equation applies to steam as well as other gases is not only true so long as the steam remains in a gaseous state, but when saturated steam expands adiabatically through an orifice, condensation takes place and other means must be used to find the quantity flowing.

Mr. Geissinger's equations are very valuable for field work, where calculations are usually made with the slide rule and the results are close enough for all practical purposes.

T. G. Estep, Jr.