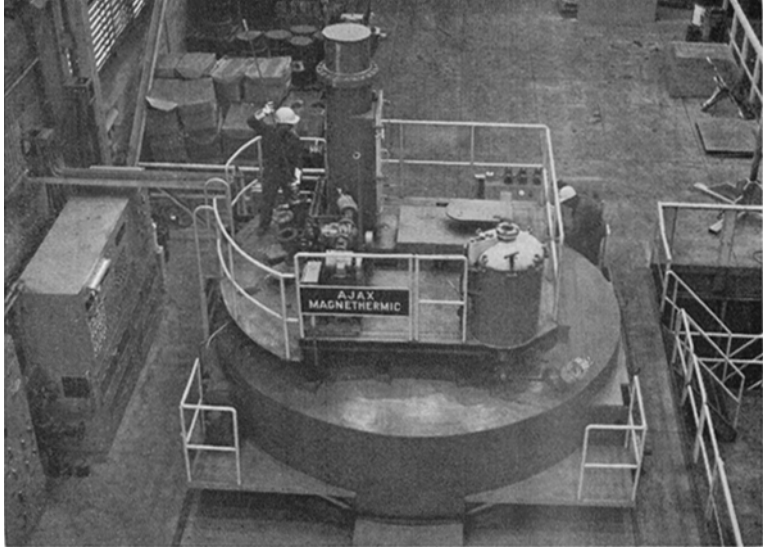
Largest Vacuum-Induction Furnace On Stream

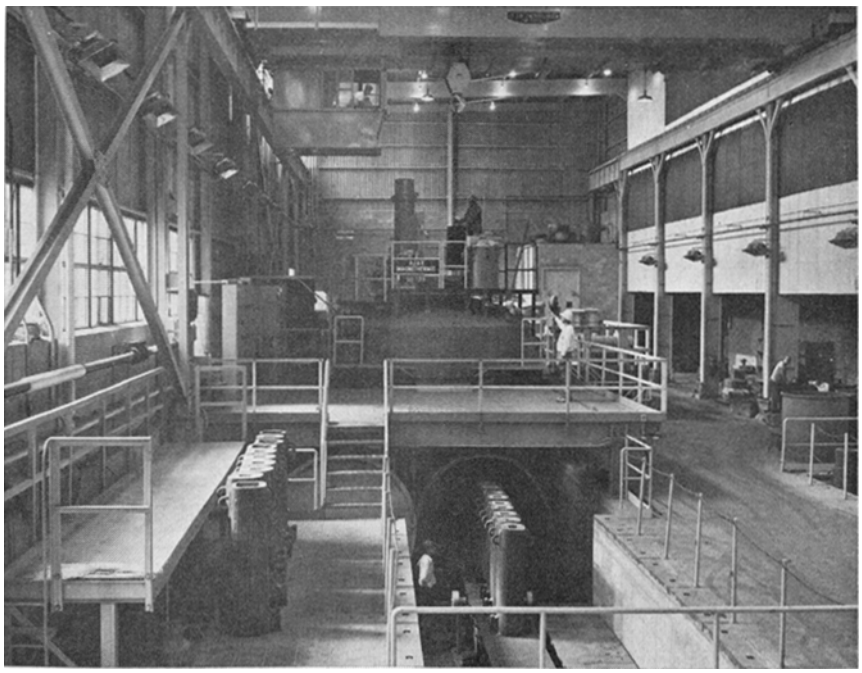


To help meet the growing need for top-quality vacuum-melted steels, the Carpenter Steel Co. has begun operations of a new vacuum-induction furnace believed to be the largest in any integrated steel plant. Installed at the Carpenter works in Reading, Pa., the furnace is designed for eventual operation at a total melt capacity of 15,000 to 20,000 lb per heat cast in one or more ingots.

When in full production it will boost Carpenter's total vacuum-melting capacity from 10,000 tons per year to over 20,000 tons per year. This figure includes 11,000 tons from vacuum-induction furnaces and 9000 tons from vacuum consumable-electrode furnaces. The large induction furnace holds the possibility of significant decreases in costs of vacuum melting and further refinements in the quality of premium-grade specialty steels.

Carpenter plans first to use the new furnaces as an integrated full-scale production facility for high-temperature alloys, such as Waspalloy, Carpenter 901 and 718, stainless steels, tool steels, and other specialty steels. The company also plans to explore the possibility of bringing hot metal from the adjacent electric-arc furnace shop and super-degassing it in the new furnace.

The advantage of using hot metal and refining it under a vacuum of five microns (well below the 100- to 300-micron range of ordinary degassing), plus the further advantage of being able to cast the degassed metal while still under vacuum rather than in air, may provide a more economical method of producing vacuum-quality steels than currently employed. Such a super-clean ingot could then be remelted in a vacuum consumable-electrode furnace and forged on the Carpenter press to obtain the ultimate in metal soundness.



AT CARPENTER STEEL CO.—charging cylinder being lowered onto dolly for entry into vacuum-lock of new induction furnace.

About 37 ft from top to bottom and 58 ft at its longest point, the furnace can handle molds to cast ingots ranging from 9 in. through 28 in., slab ingots, or electrodes for vacuum consumable remelting. Molds may be teemed on a mold car or on a rotating turntable. The mold car, hydraulically powered, enters an 8-ft diameter tube on one wing of the unit and passes through the midsection underneath the pot into the far wing, which is dead-ended. As soon as the trailing edge of the mold car has cleared the tube door, the door can be sealed, vacuum pumping can begin, and melting can then proceed.

As ingots are teemed at the conclusion of a melt, the mold car returns toward the entry door. On completion of teeming and release of vacuum, the door opens and the mold car with its ingots returns to starting position. This mold car is then removed hydraulically from in front of the door, and a second mold car, which has been previously readied with a new mold setup, is positioned for entry without delay. The single-end entry design keeps down over-all length of the installation and reduces mold-handling space requirements.

Use of the turntable, which is mounted within the main vacuum chamber, permits multiple teeming of ingots longer than those that can be handled on the mold cars. Molds are positioned on the turntable through the top of the main shell.

Total volume to be evacuated is about 8000 cu ft. The unit is designed for the lowest pressures obtainable in vacuum melting equipment. The pumping system is of the conventional type, consisting of oil diffusion pumps backed by mechanical pumps.

Electrical power coming from outside lines at 13,500 v is stepped, down first through a large oil-cooled transformer, and then through two smaller air-cooled transformers to give 180-cycle coil energy. The furnace has a design-power rating of 1500 kw at 750 v, with a peak furnace power rating of 2100 kw at 750 v.