THE INDUCTION STIRRER

THE first American electric-arc furnace, a tiny two-ton rectangular unit, went into operation in 1906 in the plant of Holcomb Steel Company, Syracuse, New York.

In those early days, the electric furnace was considered merely an improvement on the ancient crucible process for making fine steels in small batches. (The historic Damascus and Toledo blades were made by essentially the crucible method.) Before long, however, electric furnaces had supplanted the crucible process almost entirely.

The first electric furnaces produced a few types of high-cost, high-quality steels of very special compositions. Today the electric furnace, still the predominate source of the finest quality steel, is capable of making practically all known grades, including stainless steel, high-speed and other alloy tool steels, special alloy steel, and construction alloy steel. And, although steel made in electric furnaces represents only 6 to 7 per cent of our total steel production, electric furnace steel today is indispensable to American industry.

The Modern Electric Furnace

Two distinct types of electric furnaces are now in common use: the induction furnace and the electric-arc furnace. The former induces high-frequency current of high amperage in the furnace charge, the resulting heat melting and refining the charge. Such furnaces are comparatively small, a charge of four tons being unusual, and are used to a limited extent for melting high-grade alloys.

The *electric-arc furnace*, however, is practically universally used in the quantity production of electric steel. This furnace employs the intense heat of an electric arc to melt the charge and refine the steel. Arc furnaces of 100-ton capacity are now in use.

Most modern electric-arc furnaces are refinements of an early design, the Heroult furnace, which was developed by Dr. Paul Heroult. The modern electric-arc furnace built by American Bridge is still known as the Heroult furnace, although this type of furnace is now also made by other manufacturers.

The shell of this type of furnace is usually cylindrical, lined throughout with special types of firebrick. The furnace roof is a simple flat dome, also firebrick-lined, through which three massive graphite electrodes project down into the furnace through circular openings spaced at the points of an equilateral triangle. Each electrode is supported by an individual mast structure capable of being raised or lowered to provide separate movement of any electrode.

Most large furnaces are charged from above and known as the "top-charge" design. The electrodes are raised and the entire roof structure swung aside to permit loading the furnace by charging buckets from above. All furnaces of the Heroult type are designed to tilt in two directions, one for de-slagging and one for pouring the finished heat. The entire furnace is mounted on rugged, toothed rockers which mesh with toothed rails. Electric motors tilt the structure by means of a crank and lever mechanism.

Operation of the Conventional Furnace

Unlike the open-hearth furnace, the electric furnace is usually charged exclusively with scrap. The alloy content of the scrap must be accurately known so that best operation of electric furnaces demands careful selection of the scrap and a scientific scrap segregation or control program.

After the furnace has received its