became apparent that economies in construction, involving the use of a central cutting oxygen passage with an auxiliary preheating gas system, such as was used in the earliest cutting torches, would outweigh considerations of appearance or styling. A typical heavy cutting torch designed to pass 20,000 cu ft per hr of

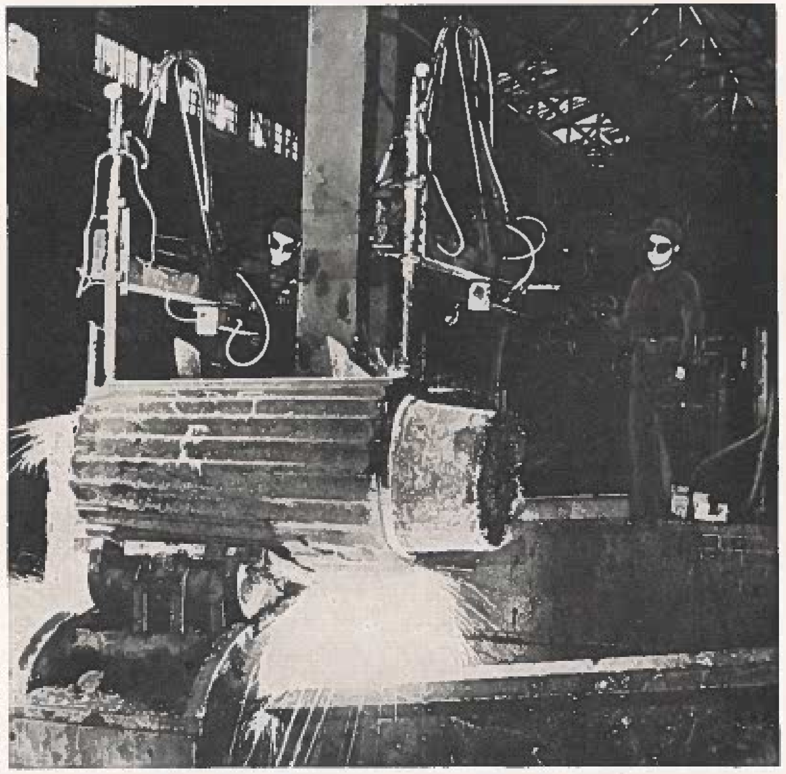

FIG. 18-6. Production cutting of 32-in. ingot.

cutting oxygen is shown in Fig. 18-5. This cutting torch consists of a head to hold the cutting tip and a cutting oxygen passage ending in a rear end containing connections to the oxygen-supply system and to a pressure gauge. The preheating gases are supplied through an auxiliary system of tubing and preheating orifices surrounding the central cutting oxygen orifice. Gas-control valves are located in a separate fixture and are suitably proportioned to reduce pressure drops to a minimum. With such equipment, the cutting oxygen orifice becomes the controlling

factor in determining the characteristics of the cutting oxygen jet, and proper regulation of the cutting oxygen flow is readily obtained.

Heavy cutting machines have been developed which provide a steady forward motion of the cutting torch at speeds as low as 1 in. per min. Standard straight-line and profiling machines are available, as well as special machines designed for specific applications such as cutting heavy rounds in production work (Fig. 18-6). These machines must be of rugged construction to stand up under severe working conditions resulting from the heat of the cutting operation and the large volume of cutting slag produced. All working parts should be protected from the mill atmosphere by suitable housing, and heat-deflector shields used to prevent overheating of the machine.

OPERATING TECHNIQUE

When cutting material over 12 in. in thickness, a certain degree of preheating is required to avoid cracking. The heavier the material the greater the tendency to cracking due to the strains set up by the heat of the cutting operation. While preheating of material is considered necessary only in the case of medium- or high-carbon steels when cutting thin sections, all material regardless of carbon and alloy content should be preheated when cut in heavy sections. The degree of preheat required will vary depending on the nature of the work being done, with a minimum preheating temperature of 700°F being recommended.

Considerable thought must be given to the sequence of the cutting operation to avoid the building up of excessive stresses in the cut surface which can cause cracking. A careful study of the cut to be made should always precede the actual cutting operation. The point at which the cut is started and the freeing of the scrap from the cut as it progresses should be considered from the point of view of reducing the locked-up stresses caused by the heat of cutting. Since heavy cutting involves material the spoilage of which will entail a considerable cost, the importance of proper preheating and equalizing of preheating temperature throughout the mass as well as the necessity for a careful planning of the sequence of cutting cannot be overemphasized. Careful attention must be given to both the starting and finish-