jackets where they passed through the roof of the furnace, and were raised and lowered by automatic electric regulators. The electrodes did not touch the surface of the bath, but were kept just above the slag line. Ore and lime were added from time to time, and the slag removed three times during the melting and a new slag made by further additions of ore and lime, by which means the impurities

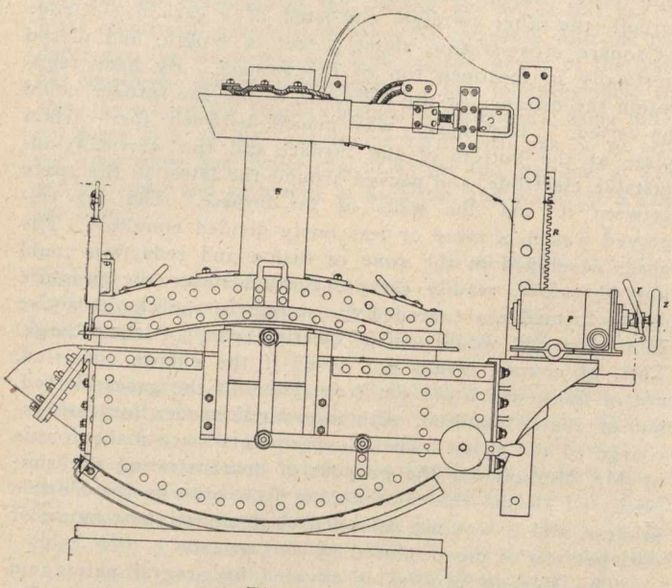

Fig. 3. Profile.

in the scrap were almost entirely removed. The electrodes were two meters long, and 400 mm. square in cross-section, and weighed 500 kilogrammes. They lasted one week, and the old electrodes were ground up and mixed with 50 per cent. of new material. The cost of each electrode was about 60 kronor, or about $16. The average make was about 40 tons per week, charges taking about 9 hours each. The charge when finished is not tapped, but poured into the ladle from a spout.

The furnace at La Praz is almost identical with that at Kortfors, except that it is somewhat smaller, and the electrodes are not surrounded by water jackets at the junction with the roof.

The usual charge is about three tons, and consists entirely of miscellaneous scrap, with suitable additions of ore and lime. When the furnace was demonstrated to the Commission, the first charge was a low carbon steel for transformers. As only a small quantity of steel was required, an exceptionally small charge was made. The charge was as follows: Miscellaneous scrap, 3,307 lbs.; iron ore, 330 lbs.; lime, 246 lbs. The scrap was charged with some lime and then additions of ore and lime were made from time to time.

When the bath of metal and slag was completely melted, the slag was poured off, great care being taken to remove the slag entirely; a new slag was then made by adding about 55 lbs. of lime, 15.5 of sand, and 15.5 lbs. of fluor spar. This was melted and kept in the furnace for some time, when it was poured off as completely as possible, the last traces being raked off the furnace through the pouring door. Another addition of lime and fluor spar, etc., in the same proportion as the last, was then made to form a finishing slag to remove the last traces of impurity; about 1.5 lbs. of ferro-manganese was added, and the charge was poured into the ladle, a little aluminum being thrown into the ladle before the metal was teemed into the ingot moulds. The furnace was ready charged at 7.45 p.m., and the current put on, and it was poured at 12.15; time, 4½ hours. The very short time taken for the operation was due to the smallness of the charge and to the fact that no time was required for recarburizing the very low carbon steel. The steel when teemed ran from the ladle freely, no appreciable scrap being left behind; it was very quiet in the ingot moulds, and the steel ingots were exceptionally sound for steel of this quality. The yield was: Ingots, 2,820 lbs.; scrap, 9 lbs. This was a special steel for transformers, and M. Héroult said before it was made that it would not weld, as to obtain the special qualities required for the electrical firms he purposely sacrificed the welding qualities. In other respects the steel gave excellent results; it forged remarkably well, without trace of red shortness, and gave very good cold bending tests.

The electric energy consumed was 1,410 kilowatt hours, equivalent to 0.216 electric horse-power years, equal to 0.153 horse-power years per ton of steel produced.

Another charge was for a high carbon steel. The same scrap was used, and the charge was as follows: Miscellaneous steel scrap, 5,733 lbs.; ferro-silicon, 19 lbs.; iron ore, 430 lbs.; lime, 346 lbs.; ferro-manganese, 3.3 lbs. Commenced to charge at 11.40 a.m.; current put on at 11.50, but all the current not on till 12.45; tapped at 7.40 p.m.; time, eight hours.

The scrap and part of the lime were charged before the current was switched on, and the remainder of the ore and lime was added during the melting. After the charge was completely melted, the slag was poured off, great care being taken to remove it as in the previous charge, and a second slag was made by adding 88 lbs. of lime and 22 lbs. of sand and 22 lbs. of fluor spar. This was melted and removed, and a finishing slag formed by the addition of similar quantities of lime, sand and fluor spar. The charge was completely melted at 5 p.m., five hours and twenty minutes after charging, and if soft steel had been required, the furnace would have been ready to tap at this time. The bath, however, had to be re-carburized to the required point and this was done by adding in the furnace "carburite," a mixture of pure iron and carbon, until the required degree of carburization was obtained, 19 lbs. of 12 per cent. ferro-silicon being also added at the same time. The charge was sampled in the usual way with a spoon ladle, and when the furnaceman was satisfied that the bath contained the required percentage of carbon, the metal was poured into the ladle, a little aluminum added, and the steel teemed into the ingot moulds. The metal ran very freely, leaving no skull in the ladle, was quiet in the moulds, and forged ex-

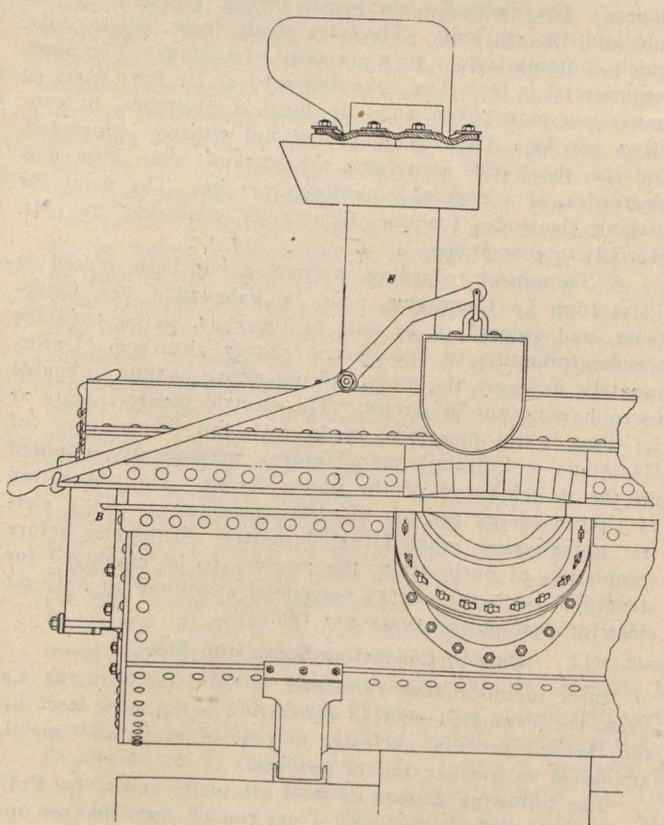

Fig. 4. Half Elevation.

tremely well in the press; the welding tests were very satisfactory. The yield was 5,161 lbs., equivalent to 2,000 lbs. of steel ingots for every 2,230 lbs. of scrap and metal charged. The electric energy used during the working of the charge was 2,580 kilowatt hours, equivalent to 0.395 electric horse-power years, equal to 0.153 electric horse-power years per 2,000 lbs. of steel produced. Had this charge been required for soft steel, it would have been ready