Electrode plant	6,000
Unforeseen expenditure	43,200
	$700,000

Amortization, 5%
Depreciation, 5%
Interest, 5%
} 15% on $700,000 = $105,000.

On a production of 43,200 tons per year of 360 days per ton of pig-iron $2.43

Cost of Production Per Ton Pig-iron.

Ore (55 per cent. metallic iron) at $1.50 per ton	$ 2.70
Charcoal, ½ ton at $6.00 per ton	3.00
Electric energy, amortization, etc.	2.43
Labor	1.00
Limestone	0.20
Eighteen pounds of electrode at 2 cents per pound	0.36
General expenses	1.00
Total	$10.69

General Remarks.

The ores treated, with the exception of the hematite and the roasted pyrrhotite, contained a high percentage of magnesia, producing a very infusible slag. When the furnace had been running for some time this infusible material formed a scale around the crucible, the electric energy available not being sufficient to keep it in a molten condition. The crucible and lower part of the furnace were, therefore, partially filled up, preventing easy access of the charge to the reducing and melting zone. This slower feeding left the charcoal on top of the furnace exposed to the air a longer time, thus increasing the amount of charcoal required and decreasing the output. With a greater current than was available and consequent higher temperature, the formation of the scale would have been prevented and the output correspondingly increased.

The electric installation at our disposal was far from ideal for electric smelting experiments. Aside from the drop of voltage due to the frequent slipping of the belt connecting motor and generator, it was impossible to increase the current beyond 5,000 amperes at from 35 to 40 volts. This inelasticity of the system prevented the determination of the most suitable current and voltage for a given charge in the furnace.

Summary of the Results of the Experiments.

1st.—Magnetite can be as economically smelted by the electro-thermic process as hematite.

2nd.—Ores of high sulphur content not containing manganese can be made into pig-iron containing only a few thousandths of a per cent. of sulphur.

3rd.—The silicon content can be varied as required for the class of pig to be produced.

4th.—Charcoal, which can be cheaply produced from mill refuse or wood, which could not otherwise be utilized, can be substituted for coke as a reducing agent, without being briquetted with the ore.

5th.—A ferro-nickel pig can be produced practically free from sulphur and of fine quality from roasted nickeliferous pyrrhotite.

6th.—The experiment made with a titaniferous iron ore containing 17.82 per cent. of titanic acid permits the conclusion that titaniferous iron ores up to perhaps 5 per cent. titanic acid can be successfully treated by the electric process.

A DEMONSTRATION IN STEAM TURBINE DESIGN.

There was recently installed at the Kent Avenue Station of the Brooklyn Rapid Transit Company, a 5,500 kw. steam turbine, the makers of which claimed certain superiority of design in various details. It now transpires that for a considerable time this turbine has been operating under conditions tending to subject this construction to abnormal strains of an unforeseen and severe character, and the way in which the claims of the makers have been borne out under these conditions must necessarily be taken into serious consideration in future turbine design.

Previous to April 25th, the turbine had been in continuous daily operation since March 30th, on which date it had been opened up for inspection after operation under severe over-load conditions.

Summed up briefly, this turbine was run daily from March 30th to April 25th with a knife leaf wedged in between the rotor and stator and the latter part of the time with the shrouding of the blades grinding against the stator. Yet when opened up, no destruction of the parts had occurred and no distortion of the blading. Considering the high speeds and centrifugal strains involved, such a result is certainly as remarkable as it is unexpected.

FIG. 2

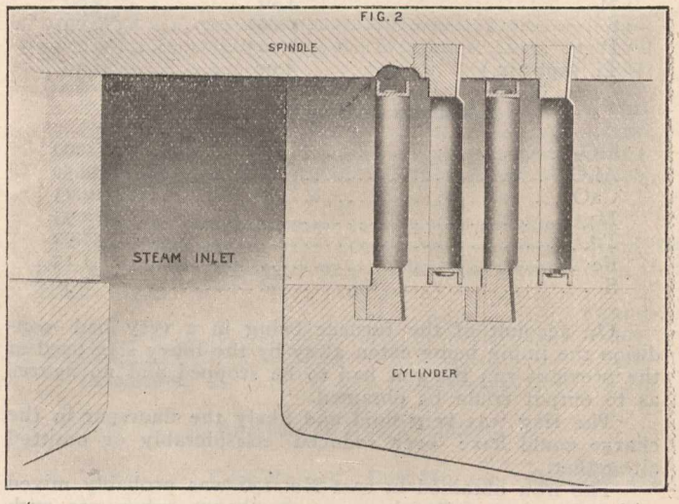

Fig. 1.

Such an operating condition as the above does not, of course, need to be taken into consideration in steam turbine design, but the above result would appear to establish without question that this form of construction overcomes entirely the difficulties and dangers arising from attempts to secure a minimum steam clearance between rotor and stator, a point upon which high efficiencies depend.

The steam turbine referred to is the product of the Allis-Chalmers Company, of Milwaukee, who have developed and control this form of construction.

The following is a brief description of the starting of the turbine and the subsequent mishap:

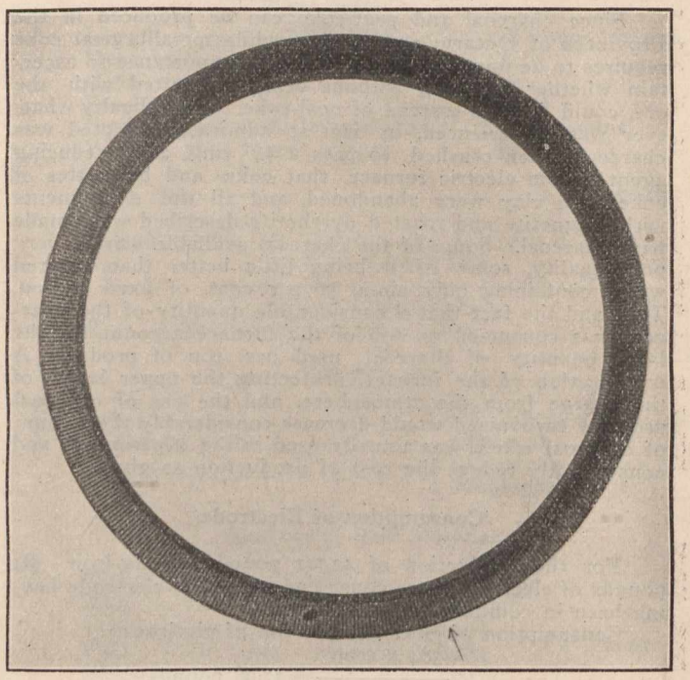

Fig. 2.

Although the turbo-alternator had been run only a few days at reduced speed to dry out the generator and had never been operated under load, it was promptly put into commission to meet urgent demands for power on March 27th, and as fast as additional boilers could be fired up load was increased until the peak for the first day was reached at over 4,000 k.w.