C. P. STEINMETZ.

INDUCTION FURNACE.

APPLICATION FILED JULY 26, 1911.

1,042,986.

Patented Oct. 29, 1912.

Fig. 1.

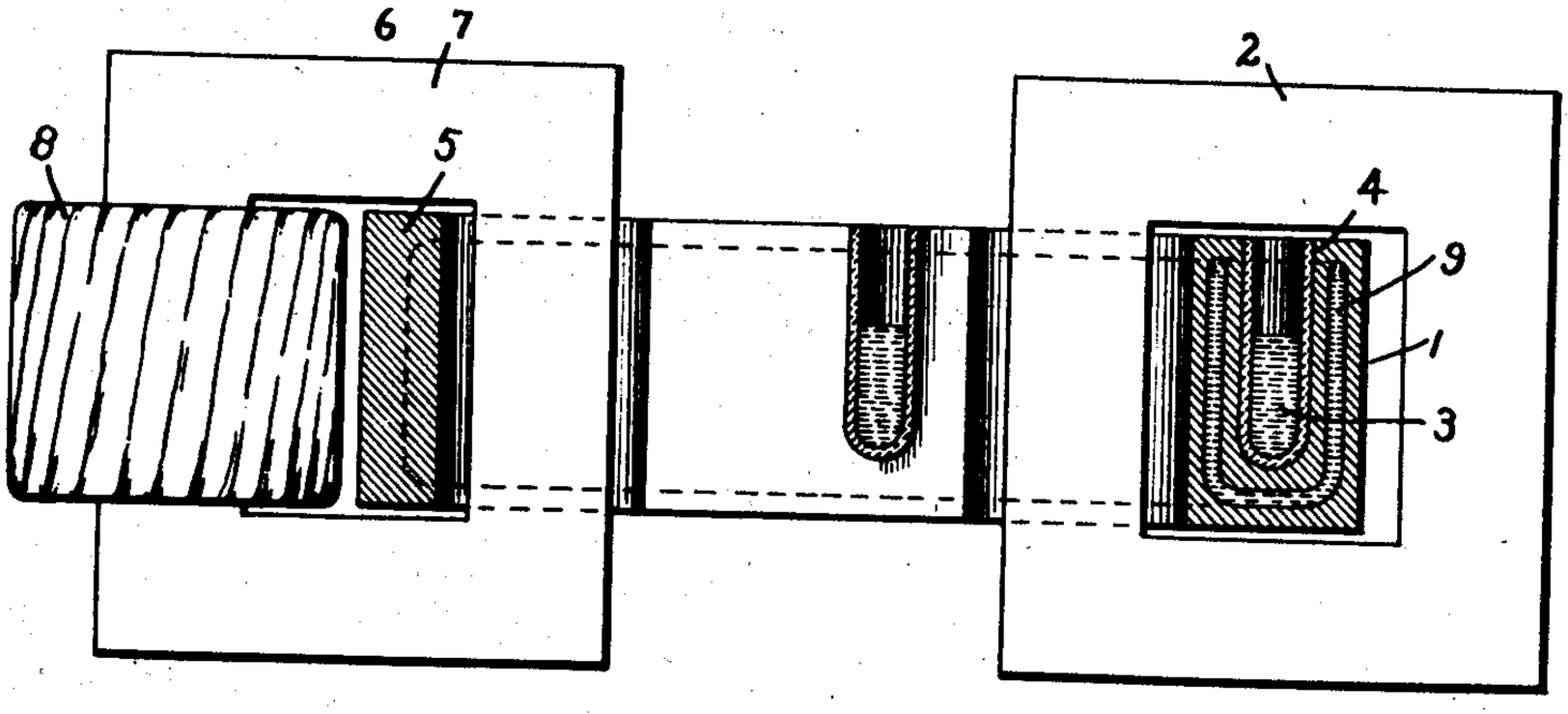
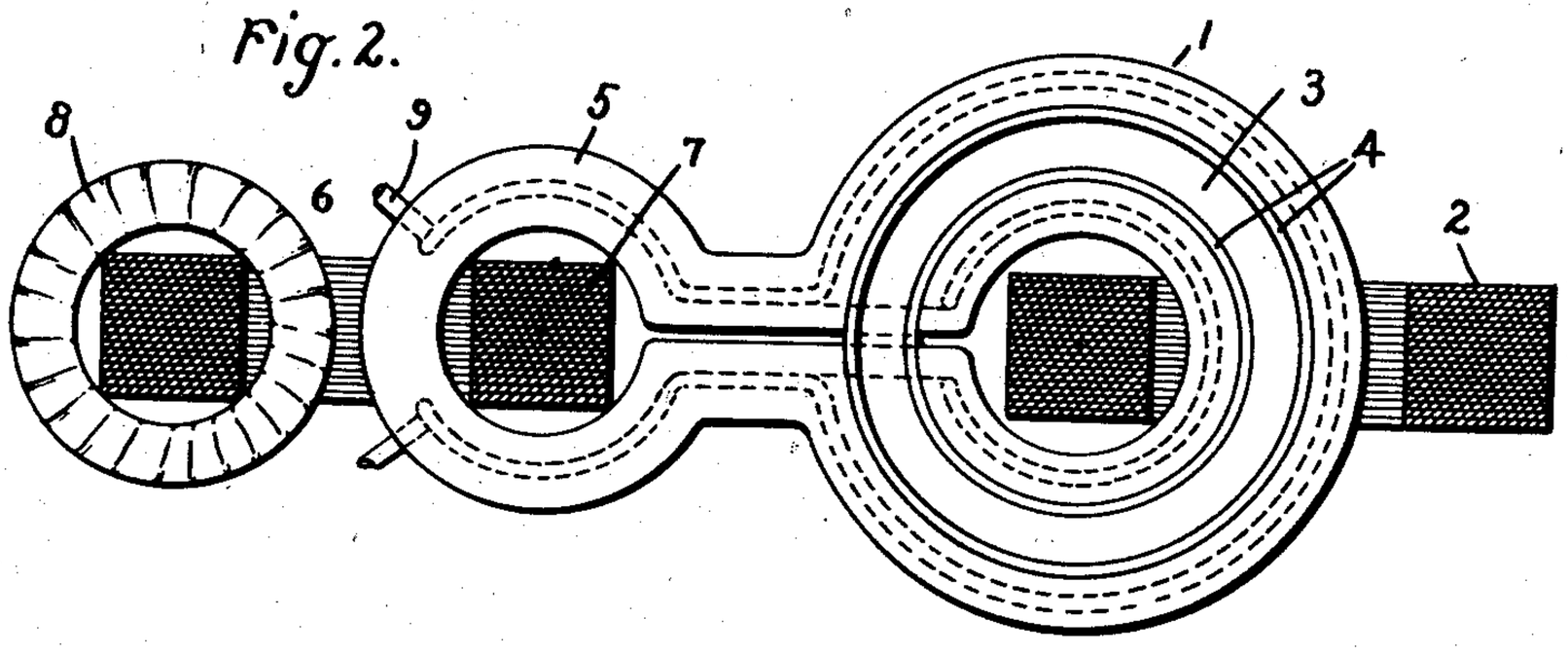



Fig. 2.




WITNESSES:

J. Earl Ryan

J. Ellis Glen.

INVENTOR:

CHARLES P. STEINMETZ,

BY Albert G. Davis

HIS ATTORNEY.

# UNITED STATES PATENT OFFICE.

CHARLES P. STEINMETZ, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## INDUCTION-FURNACE.

1,042,986. Specification of Letters Patent. Patented Oct. 29, 1912.

Application filed July 26, 1911. Serial No. 640,627.

*To all whom it may concern:*

Be it known that I, CHARLES P. STEINMETZ, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Induction-Furnaces, of which the following is a specification.

My invention relates to electric induction furnaces and comprises a furnace in which the primary and secondary windings are in close inductive relation and which, therefore, operates with a high power factor.

Metallurgical induction furnaces as formerly constructed had a considerable amount of leakage flux, in other words a portion of the primary flux completed its magnetic circuit without threading the secondary, resulting in a low power factor. As the magnetic leakage was due largely to the necessity of locating the primary far enough away from the heated secondary to secure sufficient cooling, the power factor was lowered as the size of the furnace was increased.

In accordance with my invention the primary and secondary are brought into the closest inductive relation possible by constituting the furnace crucible itself the primary winding. For this purpose, it consists of metal, the charge being insulated therefrom by a suitable lining. The crucible primary is supplied with a current of sufficiently high amperage and low voltage by making it an integral part of the secondary of a step-down transformer which thus constitutes part of the furnace.

The accompanying drawings illustrate my invention somewhat diagrammatically.

Figure 1 is a vertical section and Fig. 2 is a horizontal section of an induction furnace made in accordance with my invention.

The metallic crucible 1 makes a single turn about the leg of the magnetic core 2, thus acting as a primary winding with respect to the furnace charge 3, which acts as a secondary winding. Primary and secondary are insulated from each other by a refractory insulating lining 4 which bridges the small gap between the adjacent walls of the crucible at the region of connection with the source of current. The operating current is preferably provided by extending the primary winding 1 to constitute a secondary winding 5 of one or a few turns of a step-down transformer 6. This transformer has a core 7, and a relatively high potential primary winding 8 as usual. In furnaces of considerable capacity the primary 1 and, in some cases secondary 5, are provided with a duct 9 for the circulation of a cooling fluid such as water.

It will be observed that the current supplied to the furnace is transformed in the step-down transformers 5 to a current of low voltage and high amperage, the ratio of transformation depending, of course, upon the supply voltage. This high amperage current is utilized in the furnace by a one to one transformation to heat the charge 3.

As the primary and secondary turns are separated only by the lining 4, there is very little magnetic leakage and the furnace operates with a high power factor.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. In an induction furnace, the combination of a magnetic core, a low resistance winding on said core adapted to act as a charge-containing furnace chamber, and an insulating lining for said chamber.

2. In an induction furnace, the combination of a step-down transformer, the low voltage secondary being extended to form a single turn primary for a second transformation and adapted to support a charge to constitute a secondary circuit with respect thereto, and means for insulating said charge from the primary.

3. In an induction furnace, the combination of a magnetic core, a metallic crucible surrounding the same constituting a primary winding and adapted to contain a charge constituting the secondary winding, and means for supplying to said primary winding a variable current of low voltage and high amperage.

4. In an induction furnace, the combina-

tion of a magnetic core, means for supporting a charge constituting a winding on said core, and a single turn primary winding of low resistance located in close inductive relation to said charge.

5. In an induction furnace, the combination of a single turn primary, consisting of a metallic crucible adapted to contain a furnace charge, and means for insulating said charge from the crucible.

In witness whereof, I have hereunto set my hand this 25th day of July, 1911.

CHARLES P. STEINMETZ.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.