No. 778,194. PATENTED DEC. 20, 1904.

H. M. HOWE.

ELECTRIC FURNACE.

APPLICATION FILED OCT. 3, 1902.

NO MODEL.

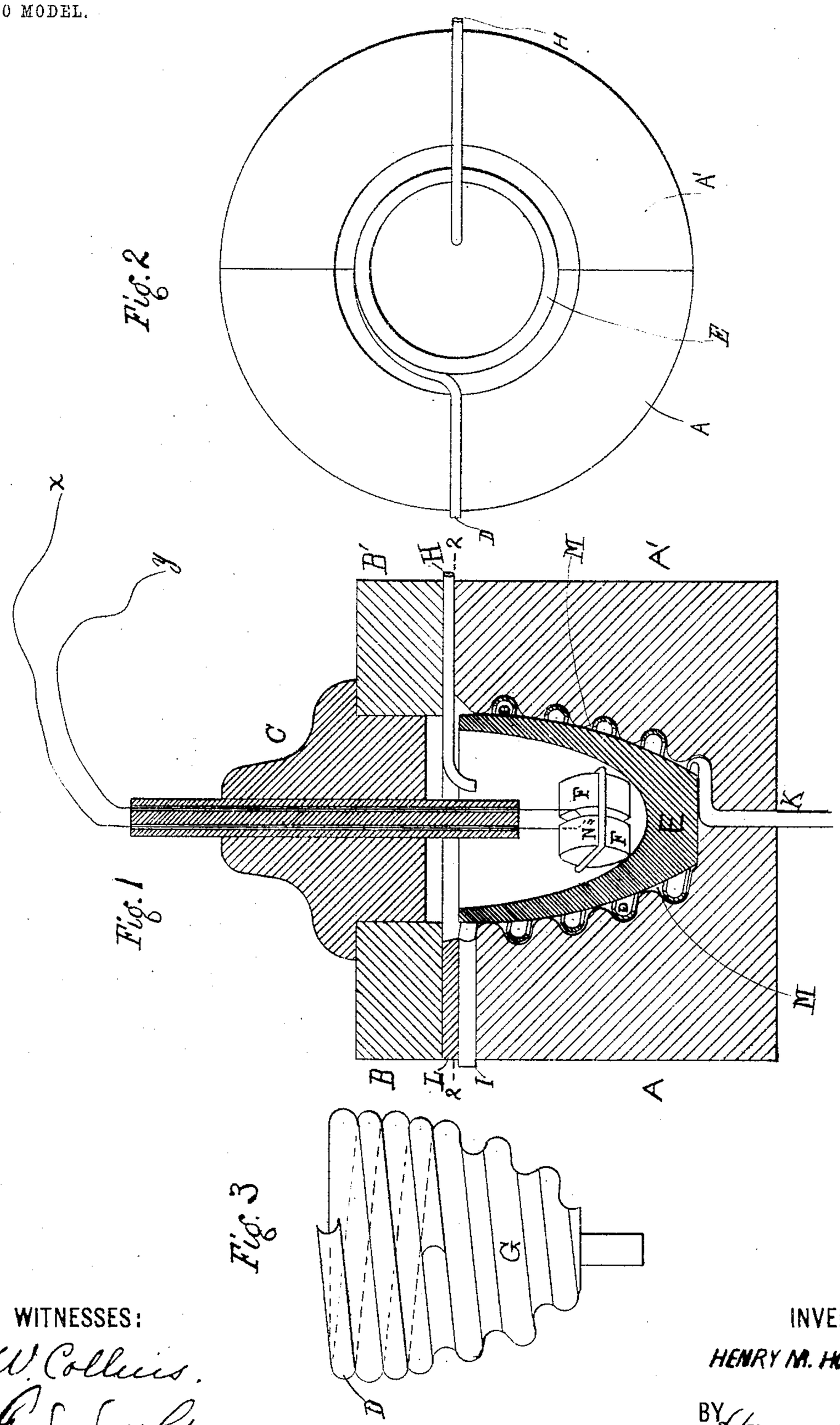

Fig. 1

Fig. 2

Fig. 3

WITNESSES:

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UNITED STATES PATENT OFFICE.

HENRY M. HOWE, OF NEW YORK, N. Y., ASSIGNOR TO EIMER AND AMEND, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

ELECTRIC FURNACE.

SPECIFICATION forming part of Letters Patent No. 778,194, dated December 20, 1904.

Application filed October 3, 1902. Serial No. 125,780.

To all whom it may concern:

Be it known that I, HENRY M. HOWE, a citizen of the United States of America, residing in the city of New York, county of New York, and State of New York, have invented new and useful Improvements in Electric Furnaces, of which the following is a specification.

The main object of my invention is to construct a simple, cheap, and efficient electric resistance-furnace more especially adapted for laboratory, dental, and other uses, as for determining melting-points of metals, calibrating thermo-electric couples by means of the melting-point of copper, determining the cooling curves of steel, or for use for any chemical or physical operation when it is desired to reach quickly and accurately a desired temperature or to hold an object for a long time at a given temperature, and especially when it is desirable to do so in an atmosphere free from the products of combustion of any fuel or in any special atmosphere.

In the accompanying drawings, Figure 1 is a vertical section of my improved furnace. Fig. 2 is a plan on the line 2 2, Fig. 1; and Fig. 3 is a detached view of a means for use in putting the heating-coil into place.

The furnace itself may conveniently consist of two semicylinders of magnesia A A′, hollowed to form the heating-chamber and provided with a cover of magnesia B B′ and a stopper C, also of magnesia, which is perforated to admit the leads *x y* of a thermo-electric couple. The furnace is heated by the spiral of platinum or other suitable wire D D, (entering and departing by the openings I and K,) through which a current of any desired strength is passed, bringing it to incandescence and to any desired temperature not above the melting-point of the heating-wire. The crucible E, which is surrounded by the heating-coil, is also preferably of magnesia.

It is not necessary that the magnesia of which the furnace is made should be absolutely pure. That which I have used has the following composition: silica, two per cent., (determined accurately;) ferric oxid and alumina, one per cent., (determined approximately;) lime, two per cent., (determined approximately;) magnesia, ninety-five per cent., (by difference.)

Magnesia may be diluted with a certain amount of lime; but the amount should not be very great, because of the tendency of the lime to slake, and the less lime the better. The presence of any large amount of silica is objectionable.

I have heard of some unsuccessful attempts with furnaces of this general class and have attributed these failures to the use of siliceous materials for the furnace-walls. Of course such a result is what we should expect, since the silica would readily be electrolyzed by the current and the resultant silicon would alloy with platinum and destroy it; but the magnesia furnace here described is free from this objection. It has been used successfully in laboratory-work in my laboratory, and temperatures up to 1,100° centigrade have been developed in it over considerable periods of time. Indeed, it has been held near 1,400° centigrade for about two hours without indication of any deterioration of the platinum.

Great care should be taken not to turn on an excessive amount of current, because this is liable to melt the platinum. The current should be controlled carefully with an ammeter and a differential rheostat. When beginning to use the furnace, the operator should first turn on the current slowly till the wire begins to glow. Then, setting the thermo-electric junction of the pyrometer in place and closing the furnace, he should increase the current very slowly and cautiously, so as to learn just what current is required to produce within the furnace the temperature which he needs.

In the illustration Fig. 1, F F are a pair of steel disks bound together, but separated by the inverted thermojunction N of the thermo-electric pyrometer. This arrangement permits the observation and record of retardations in the heating and cooling of F F—in other words, the determinations of the cooling curves of steel—a purpose for which the furnace is well adapted, as well as for the determination of melting-points. In calibrating thermo-electric couples by means of the

melting-point of copper this apparatus permits the crucible to be filled with an atmosphere composed of equal volumes of carbonic acid and carbonic oxid, a gaseous mixture which does not oxidize copper and at the same time is unlikely to cause deposition of carbon. In such an operation the mixture of carbonic acid and oxid, or any other desired atmosphere, is introduced through a pipe H, which, as well as the openings I and K, may be tightly packed, while the cover C is luted on. Absolutely air-tight closure, however, is not required, since the gas-pressure through H sufficient to maintain a plenum in the crucible and to offset small leakages will be a sufficient prevention of change of the interior atmosphere. As already observed, the parts A A, B B, and C are of magnesia. L indicates packing.

In order to increase its radiating-surface, the spiral D may be made of flattened wire, and preferably of the special U-shaped section shown, so that it may be the better adapted to the groove, while giving a large heating-surface.

To facilitate placing the spiral D in its groove M, molded within the furnace-walls, I devised the mandrel G. (Shown in Fig. 3.) The mandrel, with the wire wound upon it, is set approximately in place in the furnace. The mandrel is then withdrawn by screwing it to the left. The two halves of the furnace are at the same time pushed together, and the wire is thus fitted into the spiral groove made for that purpose in the inner faces of the furnace-walls. The metallic conductor thus laid in the spiral groove in the chamber constitutes a large part of the interior wall of the heating-chamber instead of being on the outside of the wall, as is common, so that the heat generated by the passage of an electric current through the wire is transmitted directly into the heating-chamber by radiation instead of by conduction through the walls of the chamber.

I claim as my invention—

1. An electric resistance-furnace, consisting of two internally-grooved blocks and a cover, in combination with a resistance element in the grooves of the blocks.

2. An electric resistance-furnace, consisting of a split cylinder hollowed to form the heating-chamber, and having a spiral groove in the inner face of said chamber and a heating-wire in said groove.

3. An electric resistance-furnace, having a spiral groove in the inner face of the walls of the heating-chamber and a heating-wire of U-section laid in said groove.

4. An electric resistance, having a spiral groove formed in the inner face of the walls of the heating-chamber and the heating-wire laid in said groove, as and for the purpose described.

5. An electric resistance-furnace, having a spiral groove formed in the inner face of the walls of the heating-chamber, and a heating-wire laid in said groove with a crucible to fit into said chamber, substantially as described.

6. An electric furnace consisting of two internally-grooved blocks and a cover with a plug therein, in combination with a resistance element in the grooves of the blocks.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY M. HOWE.

Witnesses:

MILTFOR BISHOP,

LLOYD BAKER.