No. 814,050.

PATENTED MAR. 6, 1906.

W. McA. JOHNSON.

ELECTRICAL SMELTING PROCESS.

APPLICATION FILED MAY 24, 1904.

Fig. 1.

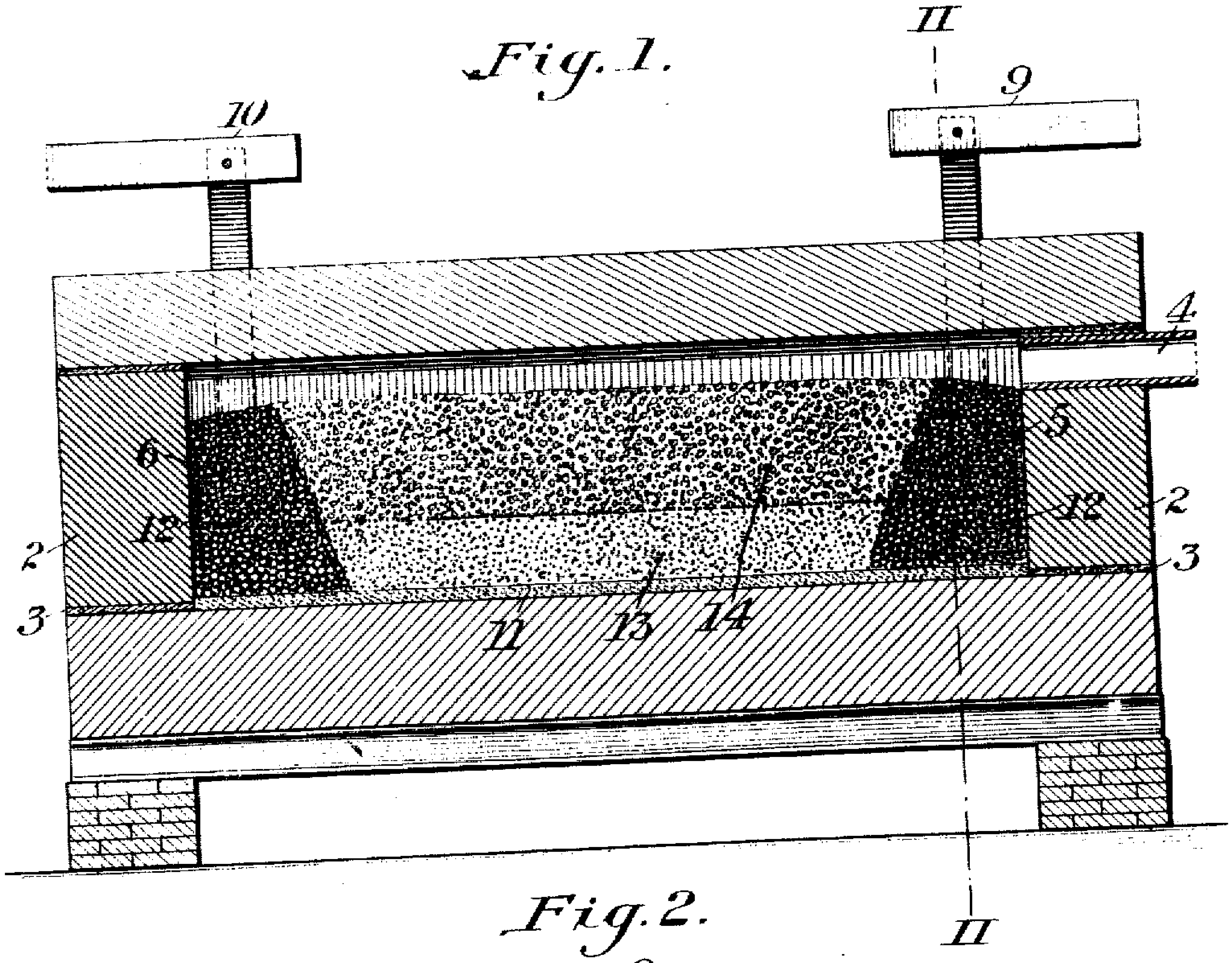
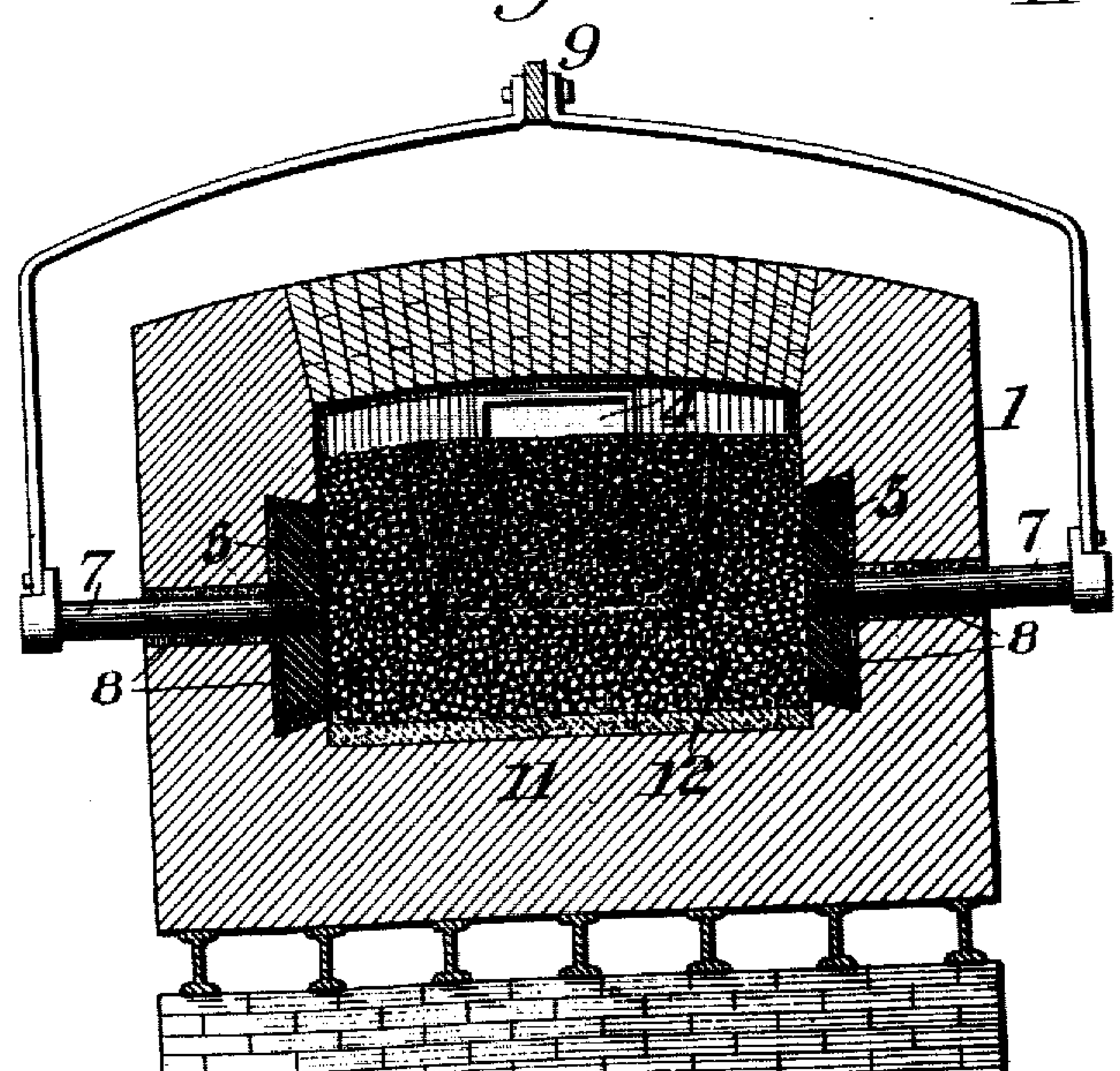


Fig. 2.



Witnesses:

R A Baldwin

J. B. Hill

Inventor:

Woolsey McA. Johnson,

by Byrnes & Townsend,

Att'ys.

UNITED STATES PATENT OFFICE.

WOOLSEY McA. JOHNSON, OF IOLA, KANSAS.

ELECTRICAL SMELTING PROCESS.

No. 814,050. Specification of Letters Patent. Patented March 6, 1906.

Application filed May 24, 1904. Serial No. 209,998.

To all whom it may concern:

Be it known that I, WOOLSEY McA. JOHNSON, a citizen of the United States, residing at Iola, in the county of Allen and State of Kansas, have invented certain new and useful Improvements in Electrical Smelting Processes, of which the following is a specification.

This invention is a process of electrically smelting ores, and is more particularly adapted for electrically smelting ores of zinc containing iron or other substance which is liable to flux or otherwise injure the walls of the retort. According to my invention, the charge is so disposed within the retort and the operation is so conducted as to substantially prevent injury of the retort by the action of constituents of the ore.

For a full understanding of my invention reference is made to the accompanying drawings, showing a convenient form of furnace for carrying out my process.

Figure 1 represents in longitudinal vertical section an electrically-heated zinc retort, and Fig. 2 is a transverse vertical section of the same on line II II of Fig. 1.

Referring to the figures, 1 represents a suitable furnace or retort, which may be constructed of fire-clay or other suitable refractory material. As shown, this retort comprises a closed chamber, the end walls 2 2 of which consist of blocks or doors having substantially the same cross-section as the furnace-chamber and are luted therein, as indicated at 3 3. An outlet 4 is provided for the volatile products of the reaction.

The electrical connections to the charge are preferably made through the side walls of the retort. For this purpose carbon or graphite blocks 5 6 are set in the side walls of the furnace near its ends, the inner faces of said blocks being substantially flush with the inner faces of the walls. Conductors 7 7, which may be of graphite or of metal, are secured to these blocks and extend outwardly through the furnace-walls for connection to the external circuit. The blocks 5 6 and the conductors 7 are luted in place, as indicated at 8, suitable luting for this purpose consisting of a mixture of water-glass and graphite. As more clearly shown in Fig. 2, the carbon blocks 5 6 are arranged in oppositely-disposed pairs, one of these pairs being located near each end of the retort. The blocks 5 5, constituting one pair, are electrically connected to one pole of a suitable generator by a conductor, as indicated at 9, the other pair being connected by the conductor 10 to the other pole of the generator. The furnace may be charged through the ends or any suitable charging-openings may be provided.

In charging the furnace I first distribute over the hearth a layer 11 of refractory material, which may be acid, neutral or basic, in accordance with the character of the charge and the material of the retort. For instance, silica, high-grade fire-clay, or bauxite may be used. Over this layer and extending across the furnace between the carbon blocks 5 5 and 6 6, constituting each of the pairs above mentioned, I arrange a body of conductive carbon, which may be in the form of rods, blocks, or plates of carbon or graphite. I prefer, however, to use the carbon in the form of a loose mass of conductive coke. These bodies of coke are indicated at 12 12 and constitute the active electrodes, the current traversing the furnace charge between said bodies. The blocks 5 6 serve to establish effective electrical contact with the removable electrodes 12 12. Above the layer 11 and extending upward against the side walls of the furnace, as indicated in dotted lines in Fig. 2, I arrange a body of high-grade ore 13, mixed with high-resistance coke. I may use for this portion of the charge a roasted zinc ore containing eighty to ninety per cent. zinc oxid with small percentages of iron, lime, and lead, mixed with eight to ten mesh coke, together with sufficient fine coke to serve for the reduction. Above and within this high-resistance portion of the charge I place the main furnace charge 14, consisting of a low-grade ore containing fifty to seventy per cent. of zinc oxid, fifteen to thirty per cent. of iron, and smaller proportions of lime, lead, copper, &c., this low-grade ore being mixed with coke to form a charge of relatively low resistance. Both high and low resistance portions of the charge are in operative electrical contact with the electrodes 12 12. The charges should be so distributed and of such composition that the heat throughout the furnace is substantially uniform.

In operation the current passes through the charge between the electrodes 12 12, raising it to the temperature required for smelting. The portion 13 of the charge, consisting of high-grade ore containing little iron, is incapable of injuring the retort and serves to effectively protect the retort from the superposed charge 14 of low-grade ore. The retort is further guarded against injury by the refractory layer 11. After the smelting operation is completed one or both of the end walls may be removed for the withdrawal of the residue and the introduction of a fresh charge, the electrodes 12 12 being used repeatedly with such addition of fresh material as may be required.

The furnace here illustrated is claimed in my copending application, Serial No. 209,997, filed May 24, 1904.

I claim—

1. The smelting process, which consists in interposing between a charge containing low-grade ore, and a furnace-wall, a charge containing high-grade ore, thereby protecting said wall from the action of said low-grade ore, substantially as described.

2. The smelting process, which consists in interposing between a charge containing low-grade ore, and a furnace-wall, a charge containing high-grade ore and a layer of inert material, thereby protecting said wall from the action of said low-grade ore, substantially as described.

3. The electrical smelting process, which consists in interposing between a low-resistance charge containing low-grade ore, and a furnace-wall, a high-resistance charge containing high-grade ore, thereby protecting said wall from the action of said low-grade ore, and transmitting an electric current through said charge, substantially as described.

4. The electrical smelting process, which consists in interposing between a low-resistance charge containing low-grade ore, and a furnace-wall, a high-resistance charge containing high-grade ore and a layer of inert material, thereby protecting said wall from the action of said low-grade ore, and transmitting an electric current through said charge, substantially as described.

5. The electrical smelting process, which consists in arranging on a suitable hearth a body or charge of relatively high electrical resistance, arranging upon said body or charge a charge of lower electrical resistance, and transmitting an electric current through said charges, substantially as described.

6. The electrical smelting process, which consists in arranging on a suitable hearth a body or charge of relatively high electrical resistance, arranging upon said body or charge a charge of lower electrical resistance, transmitting an electric current through said charges, said charges being so arranged as to secure a substantially even temperature within the furnace, substantially as described.

7. The electrical smelting process, which consists in arranging on a suitable hearth a layer of inert material, arranging on said layer a body or charge of relatively high electrical resistance, arranging upon said body or charge a charge of lower electrical resistance, and transmitting an electric current through said charges, substantially as described.

8. The electrical smelting process, which consists in interposing between bodies of divided carbon constituting the electrodes a suitable conductive charge, and passing an electric current through said charge, substantially as described.

9. The process of recovering volatile metals, which consists in interposing between bodies of divided carbon a suitable conductive charge containing a volatile metal, and passing an electric current through said charge, substantially as described.

10. The process of recovering zinc, which consists in interposing between bodies of divided carbon constituting the electrodes a suitable conductive charge containing zinc, and passing an electric current through said charge, substantially as described.

11. The electrical smelting process, which consists in interposing between bodies of divided carbon a conductive charge comprising a lower layer of high-grade ore and an upper layer of relatively low-grade ore, and passing an electric current through said charge, substantially as described.

12. The electrical smelting process, which consists in interposing between bodies of divided carbon a charge comprising a lower layer of high-grade ore mixed with high-resistance carbon and an upper layer of low-grade ore mixed with low-resistance carbon, and passing an electric current through said charge, substantially as described.

13. The process of smelting zinc ores, which consists in interposing between a charge containing low-grade zinc ore and a furnace-wall, a charge containing high-grade zinc ore, thereby protecting said wall from the action of said low-grade ore, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WOOLSEY McA. JOHNSON.

Witnesses:

JOHN H. SIGGERS,

JULIA B. HILL.