H. H. BUCKMAN, Jr.

ELECTRIC FURNACE FOR METALLURGICAL PURPOSES.

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1,092,764. Patented Apr. 7, 1914

Fig. 1.

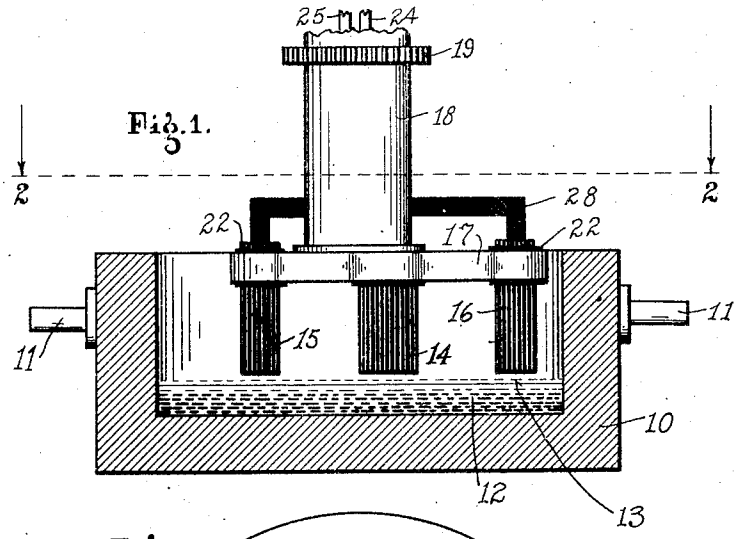


Fig. 2.

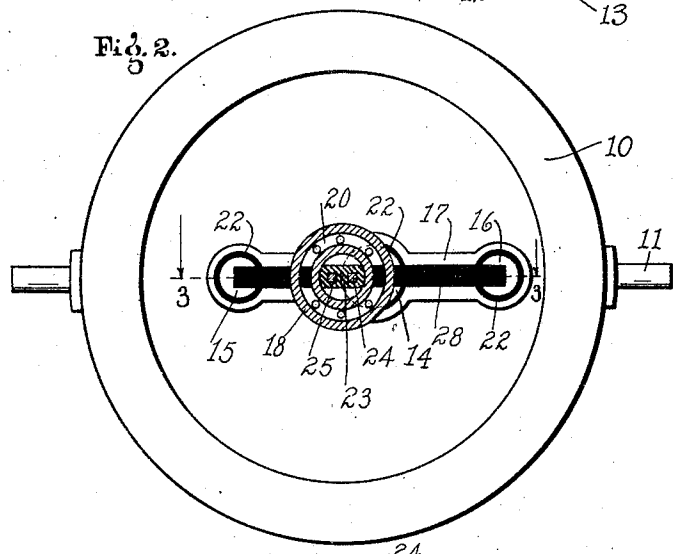
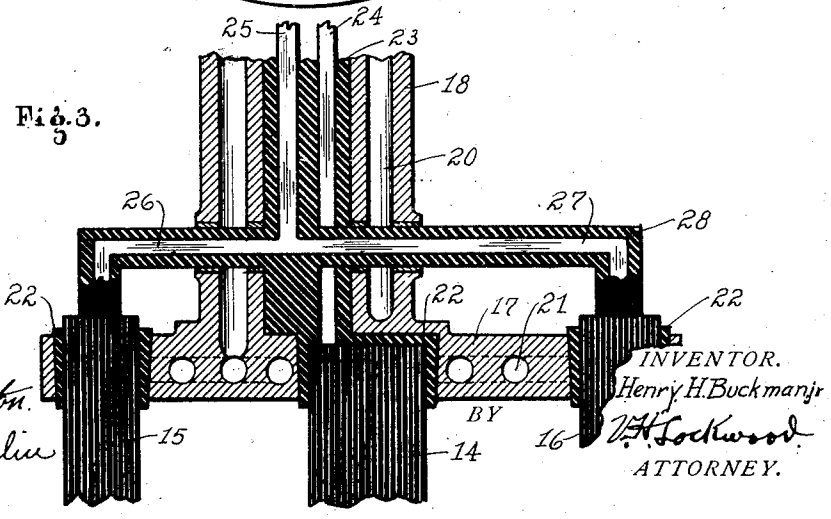


Fig. 3.



WITNESSES:

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ELECTRIC FURNACE FOR METALLURGICAL PURPOSES.

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To all whom it may concern:

Be it known that I, HENRY H. BUCKMAN, Jr., a citizen of the United States, and a resident of Indianapolis, county of Marion, and State of Indiana, have invented a certain new and useful Electric Furnace for Metallurgical Purposes; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like letters refer to like parts.

The object of this invention is to provide electrodes in an electrical furnace which move or revolve over the surface of the metal in the hearth, during the operation of the furnace, so as to distribute the heat to all portions of the body of metal to be treated and thus greatly facilitate and economize the treatment of the metal.

Heretofore in electrical furnaces the electrodes have been usually arranged so as not to have horizontal movement and, therefore, so far as horizontal movement is concerned, they have been in a fixed position. The effect of this arrangement has been to localize the heat treatment of the electrodes to a small portion of the metal in the hearth. With this invention the electrodes are horizontally moved or revolved over and close to the surface of the metal to be treated so that the heat treatment will not be localized, but made general throughout the mass of metal. For this reason the metal will be treated in very short time and with small consumption of electrical energy.

While in the furnace herein shown all of the electrodes are above the mass of metal and all revolve, still the invention is not limited to such an arrangement provided the electrodes are arranged so that as some of them move, the heat or zone of heat will be moved through the metal as the electrode or electrodes are moved.

The nature of the invention will be understood from the accompanying drawings and the following description and claims.

In the drawings, Figure 1 is a vertical non-central section through a portion of the furnace. Fig. 2 is a horizontal section on the line 2—2 of Fig. 1. Fig. 3 is a vertical section on the line 3—3 of Fig. 2.

In detail there is shown herein a hearth 10 made of refractory material of usual character for such furnaces and having spindles 11 whereby it is mounted on a suitable frame or support which is not shown. Within said hearth there is a body of metal 12 to be treated which has upon its upper surface the usual layer 13 of slag and above and close to the slag there are shown three electrodes 14, 15 and 16.

The electrodes are carried by a horizontal electrode support 17 integral with or in any wise secured to a vertical rotary member 18 which is mounted in a frame or structure, not shown, so as to be rotatable and it has secured around it and to it a gear 19 to which power is applied through means not shown for rotating said vertical member 18 and said electrode support 17, and thus revolve said electrodes in a horizontal plane immediately over the metal to be treated within the furnace. The vertical member 18 of the electrode supporting means is provided with a chamber 20 for water to cool it and said chamber is in communication with chambers 21 in the horizontal member 17 through which the water circulates for keeping the member 17 also cool.

The electrodes are secured in the support 17 by refractory insulating material 22. There is also within the member 18 suitable refractory insulating material 23 in which electrical conductors 24 and 25 are mounted. The conductor 24 extends through the insulating material 23 down to the middle electrode 14, while the conductor 25 at its lower end divides into two branches, 26 running to electrode 16 and 27 running to electrode 16, and these branches 26 and 27 extend through or are surrounded by refractory material 28 for protecting the copper conductors from the heat.

The electrode supporting means should be mounted so as to be vertically adjusted, but the means for doing this is not shown, as the idea is old in furnaces of this type. It is new, however, to arrange said electrodes and their supports so as to revolve the electrodes in a horizontal plane and it is to be noted that the electrodes are eccentrically located, the axis of their support being substantially at one edge of the middle electrode 14 and the electrode 16 being farther from said axis than the electrode 15. Therefore, the electrodes 15 and 16, as they revolve, will not travel in the same path and electrode 14, as it revolves, will swing around the axis and, therefore, cover a considerable path. The electrode 14 has a different polarity from that of the electrodes 15 and 16, so that said electrodes 15 and 16 have

the same polarity. The current may pass or arc, if the electrode 14 be a positive pole, from said electrode in two opposite directions to the other two electrodes. Hence, the other two electrodes should be preferably about equidistant from said electrode 14 in order that substantially an equal amount of current will pass to each electrode 15 and 16.

During the operation the current makes an arc between each electrode and the slag immediately beneath, and passes from the electrode 14 in opposite directions to the other two electrodes through the metal, the zone of influence extending down through the body of metal practically to the bottom of the body of metal 12, and this zone of electrical heat or influence travels or revolves around through the body of metal as the electrodes are slowly revolved and by reason of the eccentric position of the electrodes, by the time they have made one revolution they have moved said zones of electrical influence through practically the entire mass of the metal and they distribute the heat equally throughout the same. It is evident that this movement of the heating means for distributing the heat will facilitate the heating of the metal and correspondingly reduce the total amount of electrical energy consumed.

The invention is:

1. An electric metallurgical furnace including a refractory hearth, horizontal rotatable electrode supporting means extending down into the hearth, and a plurality of electrodes of different polarity extending down from said supporting means and located at different distances from the axis thereof.

2. An electric metallurgical furnace including a refractory hearth, horizontal rotatable electrode supporting means extending down into the hearth, and a plurality of electrodes of different polarity extending down from said supporting means, one electrode of one polarity being located substantially midway between the electrodes of the other polarity.

3. An electric metallurgical furnace including a refractory hearth, horizontal rotatable electrode supporting means extending down into the hearth, and a plurality of electrodes of different polarity extending down from said supporting means, one of said electrodes being located near the axis of said supporting means and the remaining electrodes being of a different polarity and located substantially equidistant from said first mentioned electrode.

4. An electric metallurgical furnace including a refractory hearth, an electrode support projecting into said hearth and mounted so as to be rotatable horizontally, a plurality of electrodes extending down from the lower end of said supporting means, and conductors for said electrodes extending through and insulated from said supporting means.

5. An electric metallurgical furnace including a refractory hearth, an electrode support projecting into said hearth and mounted so as to be rotatable horizontally, a plurality of electrodes extending down from the lower end of said supporting means, and a plurality of conductors extending through said supporting means, one of said conductors running to one electrode and the other conductor connected with the other electrodes.

In witness whereof, I have hereunto affixed my signature in the presence of the witnesses herein named.

HENRY H. BUCKMAN, JR.

Witnesses:
J. H. WELLS,
O. M. MCLAUGHLIN.