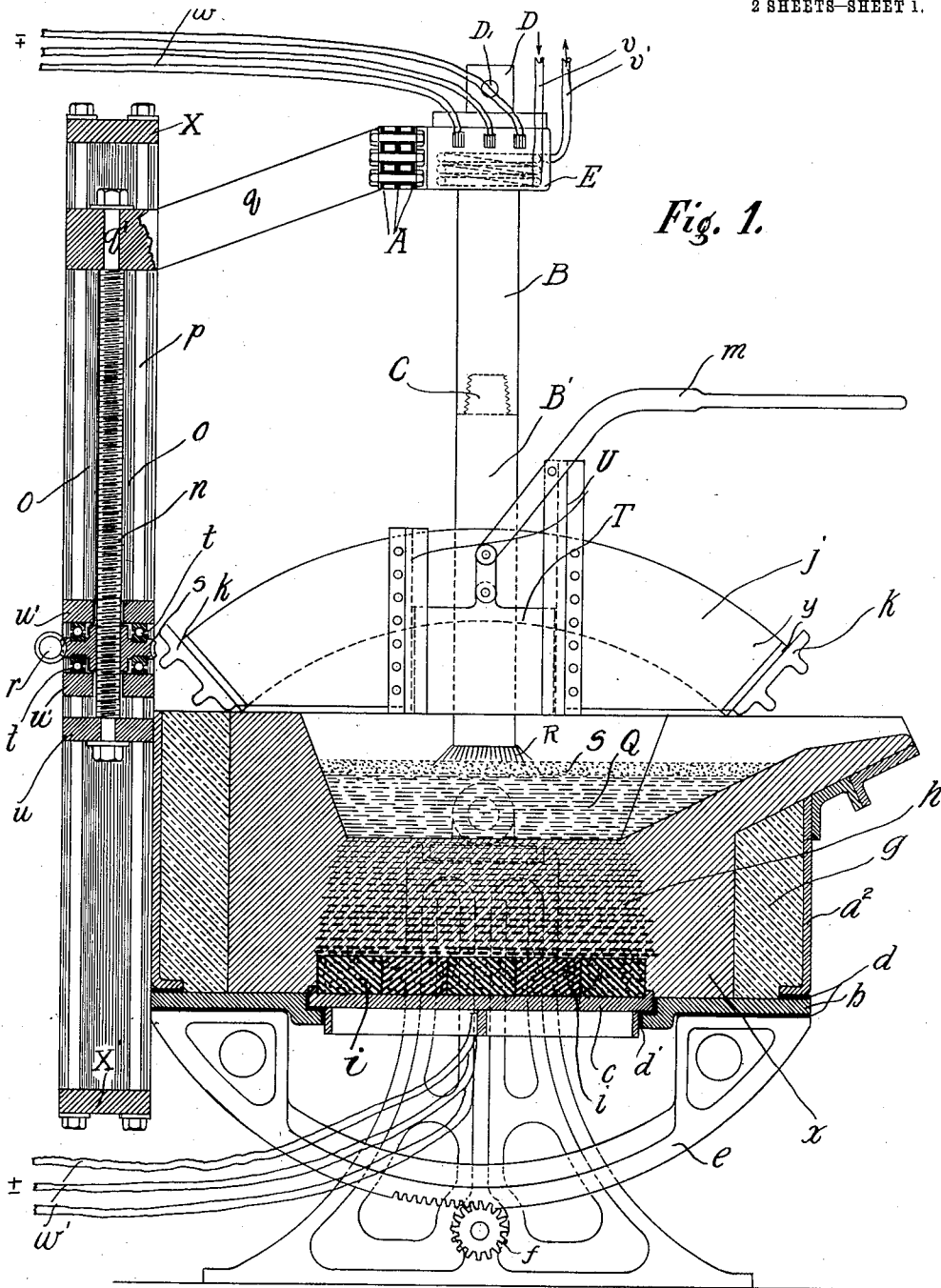


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ELECTRIC FURNACE FOR IRON AND STEEL.
APPLICATION FILED AUG. 3, 1911.

1,057,669.

Patented Apr. 1, 1913.

2 SHEETS—SHEET 1.



Witnesses.
C. R. Hingsley
M. A. Ritt

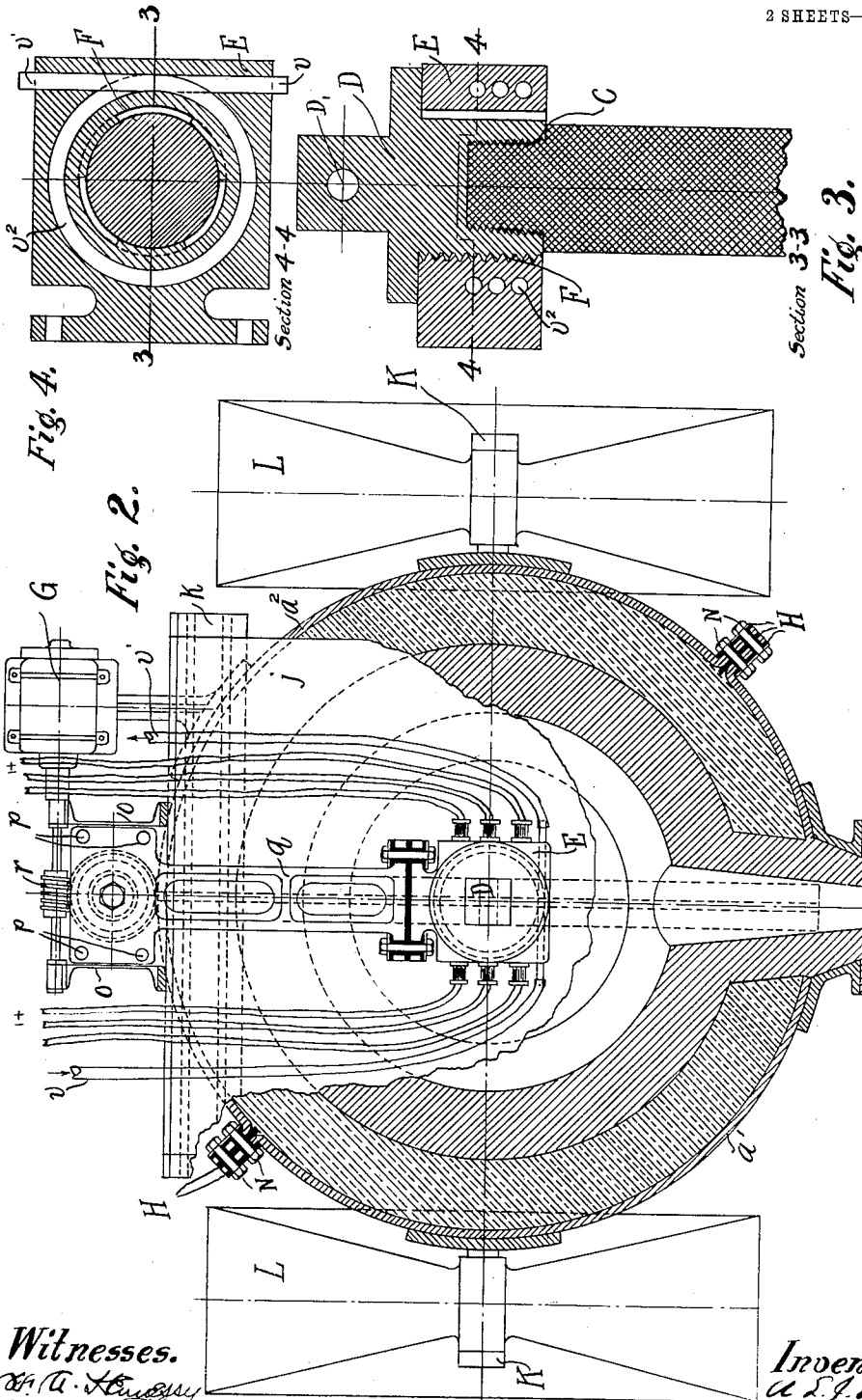
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UNITED STATES PATENT OFFICE

AUGUSTIN LEON JEAN QUENEAU, OF PHILADELPHIA, PENNSYLVANIA.

ELECTRIC FURNACE FOR IRON AND STEEL.

1,057,669.

Specification of Letters Patent.

Patented Apr. 1, 1913.

Application filed August 3, 1911. Serial No. 642,124.

To all whom it may concern:

Be it known that I, AUGUSTIN L. J. QUENEAU, a citizen of the Republic of France, residing at Philadelphia, county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Electric Furnaces for Iron and Steel; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an electric furnace for the melting and refining of iron and steel and more especially to certain features of the same whereby the furnace is made to operate simply and economically.

In the drawings Figure 1 represents a central longitudinal section, partly in elevation, of a furnace embodying my improvements. Fig. 2 represents a top plan view thereof, partly in section. Figs. 3 and 4 represent in section and on a larger scale certain details of construction of the electrode and its holder.

Similar letters of reference indicate similar parts throughout the several views.

The furnace is, as shown, preferably of the tilting type, the body of the furnace being mounted to rotate upon the two trunnions *k* supported by the two standards *L*.

The furnace lining is inclosed within a plate steel body designed as to reduce to a minimum the formation of induced parasitic currents therein. It is preferably circular in shape and is divided into two halves α^1 , α^2 which are carefully insulated from each other while being strongly held together by means of the bolts *N*. The insulation sleeves and washers are shown at *H*. To the shell is bolted the casting *b*, annular in shape, the shell being carefully insulated from the casting *b* by the asbestos plates *d*. The casting *b*, annular in shape, supports a central disk *c* contact between the two castings being intercepted by the asbestos gasket *d'*. On the plate or disk *c* rest the carbon or graphite blocks *i*, in intimate electrical contact with said disk. On the carbon blocks *i* is rammed a mixture of dead burned magnesite carrying a small percentage of

graphite, I prefer to decrease the graphite contents of the mixture in proportion to the distance from the carbon blocks, thus in contact with the carbon blocks, I make this mixture of about 10% by weight of graphite while, at the top of the layer, that along the surface forming the hearth of the furnace I reduce this percentage to 2½%, the change being made however gradually. This composition of the bottom of the hearth is indicated graphically in Fig. 1, by the varying blackness of the horizontal cross lines. The balance of the furnace lining is made of the usual mixture of magnesite and tar. I also prefer to employ, as is customary, an outer layer *g* of the refractory bricks with a low thermal conductivity, such as bricks of silica or any other suitable material.

The furnace is closed by means of the removable refractory roof *j*, made of silica bricks, and supported by means of the cast steel skew-backs *k*, held in place by the steel plates *γ*. To these two plates are riveted the charging and working doors *T* sliding between the guides *U* and operated by the levers *m*.

Through the roof *j* passes centrally, if only one electrode is used, the electrode, usually formed of two or more segments *B* and *B'*, formed with male and female ends, as is well known and understood in the art. The electrode is connected electrically and mechanically with the electrode holder *E*, mechanically fastened to the arm *q* but well insulated from it electrically by means of the asbestos washers and sleeves *A*. The electrode *B* is screwed at its upper end into the cap *D* of bronze, the inner thread of the cap *D* receiving the thread of the electrode *B*, so as to allow a ready change and a good surface contact. The cap *D* receives, on its outside, an interrupted thread *F* which interrupted thread engages a similar thread cut in the holder *E*, also of bronze, thus, by turning the cap *D* a sixth of a revolution it may be removed or engaged with the holder *E*. All the bronze holder *E* is water cooled by a wrought iron pipe *v* cast therein, the pipes *v* and *v'* bringing and removing the cooling water.

Good electrical and mechanical contact is

readily effected by the means herein disclosed. A change of electrode is made supposing that the electrode present in the furnace has become too short, as follows:—A
 5 bar is inserted in the hole D' of the cap D and the cap is turned for one sixth of a turn, thereby freeing the interrupted thread. The electrode and its cap are then removed by means of an overhead crane and a new electrode of the proper length and cap, alike in
 10 all respects to the preceding one, is lowered through the opening of the holder E until the proper level has been reached when by turning a sixth of a turn the threads are forced home. The other leads *w* of the
 15 alternating current electrical circuit are bolted to E and the path of the electrical current is therefore as follows:—down the electrode B, through the arc R, through the
 20 slag S through the steel Q, through the conducting hearth, through the carbon blocks *i*, through the plate or disk *c*, and through the leads back to the source of power. It is in order to avoid the setting
 25 up of induced currents in the metallic framework of the furnace that the various parts are divided and insulated from each other as described.

The regulation of the position of the electrode in respect with the upper surface of the molten bath in the furnace is obtained as follows:—The holder E is held by the arm *q* which terminates in an extension *q'* which engages the four guide rods *p*. Those four
 30 guide rods are held rigidly in place by the two casting blocks X, X', acting as spreaders for the channels O. To *q'* is fastened rigidly the screw *n*, and said screw is likewise fastened into the lower movable block
 35 *u* through which pass the four guide rods *p*. Thus, the screw is prevented from turning in any manner whatever, and is susceptible of linear motion parallel to the guide rods *p*. The screw *n* engages with the worm wheel *s*,
 40 which is actuated by the worm *r*, the worm being keyed on the shaft of the variable speed motor G and the thrust of the worm wheel is taken up by the two thrust bearings *t* held between blocks *u'* *u'* and the faces of
 50 the worm wheel. It is readily seen that as the worm *r* revolves it actuates the worm wheel which forces the screw *n* in a downward or upward direction according to the direction of the rotation of the motor shaft.

55 The motion of the motor may be obtained automatically by means of a relay voltmeter, as is well known in the art, the current being sent through the motor as soon as the voltage of the arc passes beyond certain limits. I prefer however to rely on the operation of the controlling switch by the furnace men.

Having thus described my invention, what I claim is—

1. An electric furnace having a working
 65 hearth made up of a rammed body of mag-

nesite and tar with graphite, the proportion of graphite increasing from the surface of the hearth downwardly, a course of carbon blocks supporting the rammed hearth, a
 70 metal plate upon which the course of carbon blocks is laid, said plate constituting one of the leads of the furnace and an outlying metal plate separated therefrom by intervening insulating material, substantially as described.

2. An electric furnace having a working
 75 hearth made up of a rammed body of magnesite and tar with graphite, the proportion of graphite increasing from the surface of the hearth downwardly, a course of carbon
 80 blocks supporting the rammed hearth, a metal plate upon which the course of carbon blocks is laid, said plate constituting one of the leads of the furnace and an outlying metal plate separated therefrom by insulating
 85 material, the furnace being likewise provided with a peripheral shell sub-divided into sections with intervening insulating material, substantially as described.

3. An electric furnace having a working
 90 hearth made up of a rammed body of magnesite and tar with graphite, the proportion of graphite increasing from the surface of the hearth downwardly, a course of carbon
 95 blocks supporting the rammed hearth, a metal plate upon which the course of carbon blocks is laid, said plate constituting one of the leads of the furnace and an outlying metal plate separated therefrom by insulating
 100 material, the furnace being likewise provided with a peripheral shell sub-divided into sections with intervening insulating material, said shell being insulated from the metal bottom, substantially as described.

4. In an electric furnace the combination
 105 with an electrode-holder, of an arm for suspending the holder and means for raising and lowering the arm, said arm being connected to the holder by a joint made up of a face plate on the arm, a face plate on the
 110 holder, connecting bolts and nuts, and insulating sleeves and washers, substantially as described.

5. In an electric furnace, an electrode holder consisting of a socket provided with
 115 an internal interrupted thread and a plug for said socket having an external interrupted thread adapted to engage that of the socket, said plug supporting the electrode, an arm for supporting said holder, and an
 120 insulated joint between the holder and the arm, substantially as described.

6. In an electric furnace, an electrode holder consisting of a socket provided with
 125 an internal interrupted thread and a plug for said socket having an external interrupted thread adapted to engage that of the socket, said plug supporting the electrode, said socket being provided with water cooled passages, an arm for supporting said holder,
 130

and an insulated joint between the holder and the arm, substantially as described.

5 7. In an electric furnace, an electrode holder made up of a fixed socket water-cooled and to which the current conductors are attached, and a plug supporting the electrode and removable from the fixed socket, substantially as described.

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

AUGUSTIN LEON JEAN QUENEAU.

Witnesses:

J. T. McLEAN,

G. HERBERT JENKINS.