No. 861,319. PATENTED JULY 30, 1907.

C. E. ROBERTSON.

APPARATUS FOR ELECTROLYTIC REDUCTION OF METALS FROM ORES OR SALTS.

APPLICATION FILED JULY 30, 1906.

Fig. 1.

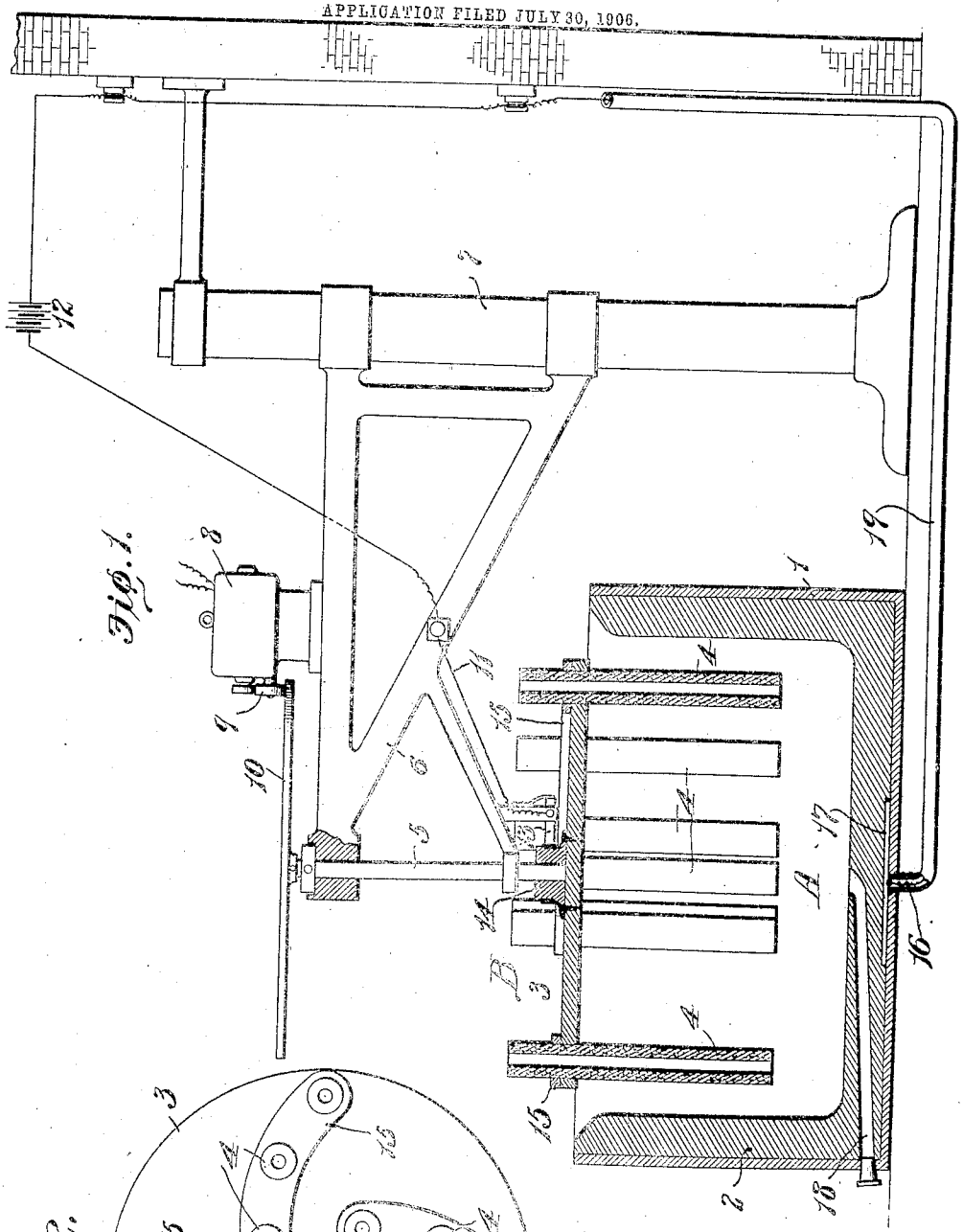
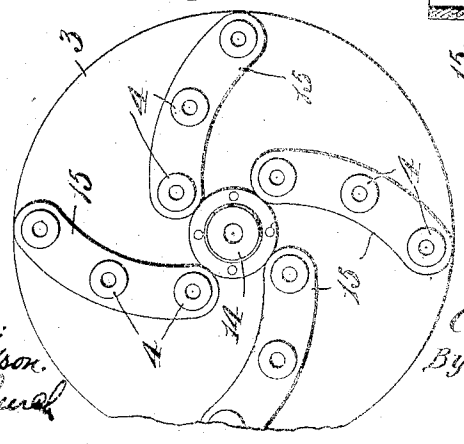


Fig. 2.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR ELECTROLYTIC REDUCTION OF METALS FROM ORES OR SALTS.

No. 861,319. Specification of Letters Patent. Patented July 30, 1907.

Application filed July 30, 1906. Serial No. 328,391.

To all whom it may concern:

Be it known that I, CHARLES E. ROBERTSON, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Apparatus for Electrolytic Reduction of Metals from Ores or Salts, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an elevation partly in section of an apparatus embodying the features of my invention; and Fig. 2 is a top plan view of the anode-carrying member.

This invention relates to electrolytic furnaces or pots used for the manufacture of metals from ores or salts.

One object of my invention is to provide a novel form of apparatus for the electrolytic reduction of metals from ores or salts which enables me to produce better grades of metal than are obtained with the apparatus heretofore in use, and also at a lower cost and in a shorter period of time.

The furnaces or apparatuses which have heretofore been in use for electrically reducing metals from ores or salts have not proved entirely satisfactory for a number of reasons. One objectionable feature of said furnaces was that a crust would form on top of the molten material being reduced so that the gaseous products of the reduction underneath this crust would frequently explode. Another objectionable feature of said furnaces which often caused an inferior grade of metal to be produced was that the carbon anodes which constituted part of the furnaces would not be consumed equally, one of the anodes very often conducting more current than others and accordingly becoming so hot that the metal conductor to which it was connected would melt, thereby permitting the anode to drop into the molten material so that an inferior grade of metal was produced.

My improved apparatus overcomes all of said objectionable features and consists of a cathode comprising a member for holding the material to be reduced and provided with an interior lining which is a good conductor of electricity and a coöperating member carrying electrical conductors or anodes which project into the material in the cathode, and means for imparting movement to one of said members relatively to the other for agitating the mass of material being reduced.

In the apparatus which I have herein shown as embodying the preferred form of my invention, the anode-carrying member is rotated relatively to the cathode and preferably rotated continuously, but it should be understood that an intermittent rotary movement or an oscillating movement could be imparted to the anode-carrying member without departing from the spirit of my invention, or the cathode could be moved relatively to the anodes or both the anodes and cathode rotated in opposite directions. Furthermore, while I have shown the preferred form of my apparatus as consisting of two members, one of which has a circular movement imparted thereto, I do not wish it understood that my invention is limited to an apparatus constructed in this manner as practically the same results could be obtained if a horizontal reciprocating movement was imparted to the movable member of the apparatus.

Referring to the drawings which represent the preferred form of my invention, A designates the cathode consisting of a cylindrical receptacle or pot 1 provided with an inner lining 2 of carbon or some other suitable material that is an electrical conductor. The anode-carrying member B consists of a disk 3 arranged in alinement with the mouth of the cathode and a plurality of carbon tubes 4 which are preferably hollow throughout their length and extend into the interior of the cathode, said disk being secured to the lower end of a shaft 5 which is rotatably mounted in an arm 6 projecting from a standard 7. The shaft 5 is rotated preferably by means of a motor 8 which drives a friction roll 9 that coöperates with a disk 10 secured to the upper end of the shaft 5 but it should be understood that any suitable electrical or mechanical means could be employed for imparting movement to the anode-carrying member without departing from the spirit of my invention.

The current is supplied to the carbon anodes by a wire 11 leading from a battery 12 or any suitable source of electrical energy to a brush 13 which coöperates with a conductor 14 secured to the upper face of the disk 3, said disk also carrying a plurality of conductors or bus-bars 15 to which the carbon tubes 4 are connected, as shown in Fig. 2.

The current is supplied to the cathode by a wire 16 extending from the battery to the carbon lining 2, a metal plate 17 being preferably interposed between the bottom of the receptacle 1 and the carbon lining covering the same, and the wire 16 being connected to said plate, as shown in Fig. 1. As shown in Fig. 1, the cathode is provided with a discharge tube 18. A switch can be provided for controlling the current and the wires can be inclosed in conduits 19.

From the foregoing description the operation of the device will be obvious, the rotary movement of the disk 3 causing the anodes 4 to thoroughly agitate the mass of material in the cathode so that the resistance of molecular dissociation will be decreased due to the fact that the reducing agent is brought into more intimate contact with the material being reduced and the pressure in the cathode diminished, thus accelerating the formation of the products of the reduction. Furthermore, a crust cannot form on top of the mass so that the gases from the material are permitted to escape. As the anodes project down into the material being reduced and are hollow throughout their length they will

act as conduits to permit the escape of any gases which may be formed from said material.

If desired, the underneath face of the anode-carrying disk can be provided with a covering of heat-resisting material thus making it possible to maintain a very high temperature in the furnace, this being desirable owing to the fact that a high temperature weakens the heat of formation of many ores and salts.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

An electrolytic furnace comprising a receptacle provided with an interior lining of material which is a conductor of electricity, a disk arranged in alinement with the upper end of said receptacle and provided on its upper face with conducting bars, a plurality of carbons of tubular form carried by said conducting bars and projecting through the disk into said receptacle, means for transmitting an electric current to said conductor bars and to the interior lining of said receptacle, and means for rotating said disk continuously; substantially as described.

In testimony whereof, I hereunto affix my signature, in the presence of two witnesses, this 12th day of July 1906.

CHARLES E. ROBERTSON.

Witnesses:

WELLS L. CHURCH,

CORA BADGER.