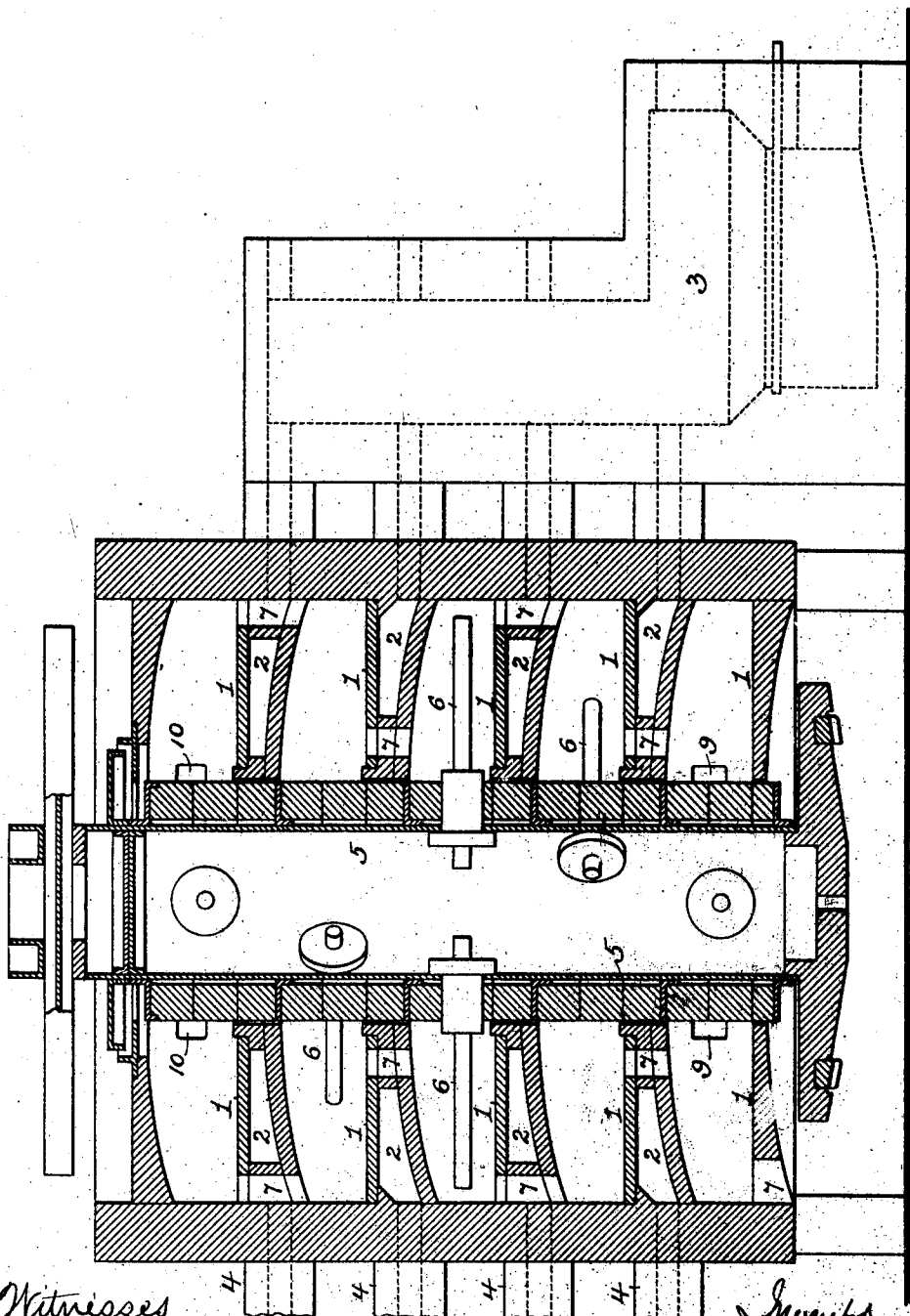


U. WEDGE.
RECOVERING COPPER FROM COMPOUNDS CONTAINING THE SAME.
 APPLICATION FILED FEB. 7, 1910.

1,043,490.

Patented Nov. 5, 1912.



Witnesses
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UNITED STATES PATENT OFFICE.

UTLEY WEDGE, OF ARDMORE, PENNSYLVANIA, ASSIGNOR TO THE FURNACE PATENT COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

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Specification of Letters Patent.

Patented Nov. 5, 1912.

Application filed February 7, 1910. Serial No. 542,630.

To all whom it may concern:

Be it known that I, UTLEY WEDGE, a citizen of the United States, residing in Ardmore, Pennsylvania, have invented certain
5 Improvements in Recovering Copper from Compounds Containing the Same, of which the following is a specification.

The object of my invention is to provide a commercially practicable method of recovering copper from oxids, carbonates or silicates of copper, or ores or concentrates containing the same, whose values have, in many cases, not been utilized because of difficulties in their treatment by ordinary
10 smelting or blast furnace methods. In some cases these ores have been of such a character as to make concentration or separation of values by gravity methods impossible, and in other cases by reason of the
15 physical or chemical character of the ore or the gangue contents it has not been commercially practicable to secure the values by fusion in blast furnace or other smelting furnaces. I have found that if such oxids,
20 carbonates, or silicates are subjected to the action of sulfurous gases, such for instance as sulfur dioxide, sulfur trioxide, or sulfuric acid vapor, the copper will be reduced to the form of a sulfate, and the latter, being
25 soluble in water, can be readily washed out and the copper precipitated or extracted from the solution by known methods.

In carrying out my invention I preferably employ a furnace of the type heretofore patented by me, and in the accompanying drawing I have shown such a furnace in vertical section.

By preference a furnace of the muffle
30 type is used, said furnace having a series of superposed hearths 1 and having, between each hearth and the arch of the chamber below it, a heating chamber 2 to which the heating gases are supplied from a fireplace
35 3 at one side of the furnace, said heating gases, after traversing the chambers 2, escaping through flues 4 to a stack or other draft inducing means.

The furnace has a central shaft 5 carrying
40 arms 6 which are intended to be provided with feeding and stirring blades or rabblers in the usual manner, whereby the material in powdered or granular form deposited upon each hearth will be constantly stirred

or agitated and will be fed over the hearth
55 from the inner to the outer portion of the same, or in the reverse direction, the material dropping from hearth to hearth through openings 7 located alternately at the outer and inner portions of the hearth. I can,
60 however, use a furnace of any construction which will permit of heating and agitating the material so as to expose all portions of the mass to the atmosphere of sulfurous gas maintained in the furnace.

The sulfurous gas desired from any available source may be introduced into the furnace at the lower hearth, as for instance at 9, and may then pass upwardly through the furnace so as to act upon the material
65 on the successive hearths, finally escaping as at 10, or the gas may be introduced at the top hearth and caused to flow downwardly through the furnace, or it may be introduced at an intermediate point and caused
70 to flow upwardly to the outlet, especially in cases where it may be advisable to subject the ore to subsequent treatment which can, in such case, be effected upon the hearth or hearths below the gas inlet, or the gas
75 introduced at the upper portion of the furnace may be taken off at an intermediate point.

The sulfurous gas will be effective for the desired purpose if it contains a percentage
80 of sulfur dioxide as low as three per cent. by volume, but its action is developed to a much better effect if the percentage of sulfur dioxide is increased to say about fourteen to sixteen per cent.

Where sulfur dioxide is used the presence of some oxygen is necessary to permit of the formation of copper sulfate in the furnace and therefore in such case the sulfurous gas will in practice be diluted with atmospheric
85 air in quantity sufficient to supply the necessary oxygen.

The material under treatment should be maintained at a temperature of from 800° to 1100° F., and whatever construction of furnace may be employed it should be designed with the view of maintaining the hearth or hearths at a temperature which will effect the desired heating of the material upon the hearth. Care should be taken to prevent
90 heating of the material to such a temperature as to bring about decomposition of the sulfate after the same has been formed, or

on the other hand, to prevent the temperature of the material from falling below that at which the reaction will take place.

In the operation of the furnace the firing of the same will be effected in such manner as to produce the temperature of the material which is best calculated to effect the desired reaction with the particular material which is being acted upon. Where the temperature of the sulfurous gas employed is sufficiently high, any other heating of the furnace may be dispensed with, but where such additional heating is required coal, oil, or other fuel may be employed, the furnace, in the latter case, being one of the muffle type, as shown, so that the products of combustion will not unnecessarily dilute the sulfurous gas employed. An effective method of carrying out my invention is to employ the furnace in which the operation is effected in connection with an ordinary roasting furnace in which sulfurous gas is developed, such gas being conveyed directly from said roasting furnace to the furnace in which the material is being subjected to my improved treatment, or a furnace constructed to carry out my invention may be

employed in connection with an ordinary blast furnace or converter, either with or without concentration of the gas in its passage from one furnace to the other.

When the sulfurous gas employed in carrying out my invention is sulfuric acid vapor or sulfur trioxid, or a combination of the latter with sulfur dioxid the addition of oxygen may not be necessary.

I claim:

The mode herein described of recovering copper from oxids, carbonates, silicates or like compounds, said mode consisting in subjecting the material to an atmosphere containing sulfurous gas and at the same time heating the compound, without direct access of the heating gases thereto, to such temperature that the reaction will form copper sulfate, and then recovering the copper from such sulfate.

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

UTLEY WEDGE.

Witnesses.

KATE A. BEADLE,
HAMILTON D. TURNER.