

UNITED STATES PATENT OFFICE.

ALWIN NIESKE, OF DRESDEN, AND ERICH MÜLLER, OF STUTTGART, GERMANY.

PRODUCTION OF METALS AND ALLOYS.

993,270.

Specification of Letters Patent.

Patented May 23, 1911.

No Drawing.

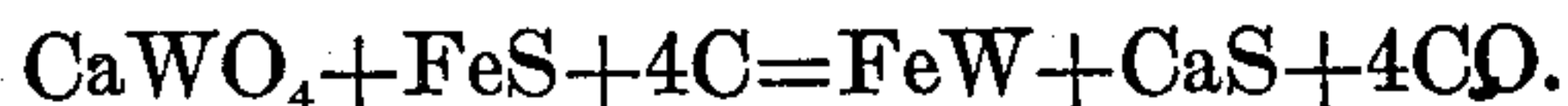
Application filed September 28, 1910. Serial No. 584,301.

To all whom it may concern:

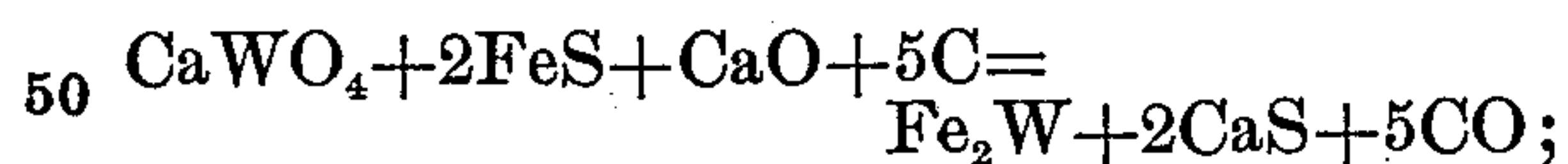
Be it known that we, ALWIN NIESKE, a subject of the King of Saxony, residing at Dresden, Germany, and ERICH MÜLLER, a subject of the Emperor of Germany, residing at Stuttgart, Germany, have invented certain new and useful Improvements in the Production of Metals and Alloys, of which the following is a specification.

10 In order to recover the metal from compounds of a metallic acid with the alkaline earths (for instance, from calcium tungstate) it is not sufficient to merely smelt them with carbon, but care must be taken
15 that at the same time the alkaline earth shall be bound or slagged. The method heretofore usually adopted, to wit, to use silica for this purpose, has the disadvantage that silicon enters the regulus, which is undesirable, and, furthermore, that the walls of the furnace are attacked. The present invention avoids these defects by smelting with the metallic acid compound and the carbon a sulfid of the same metal or of another metal. If a sulfid of the same metal
25 is employed, the product of the operation will be the metal itself. If a sulfid of another metal is employed, the product will be a metal alloy. In either case the alkaline earth constituent or constituents of the metal acid compound will be slagged by the sulfur of the sulfid employed.

The characteristic or fundamental principle of reaction incident to the practice of the method is indicated, for instance, in the production of ferro-tungsten from scheelite, by the following equation:



40 In view of the readily fusible quality of calcium sulfid, the alloy separates out as a beautiful, uniformly smelted regulus, and with a very low percentage of carbon. If it should be desired to obtain an alloy richer
45 in iron, a correspondingly larger quantity of iron sulfid must be employed and a quantity of lime equivalent thereto, as indicated in the following exemplary equation:



from which it is apparent that, if the iron alloy of tungsten is to contain a higher percentage of iron, an additional amount of calcium must be provided to take care of the sulfur not compensated by the calcium of

the calcium tungstate. It is evident, however, that the formula must vary, in every instance, with the amount of the iron sulfid present. If it is desired to obtain products
60 entirely free from sulfur it is desirable, in all such instances, to employ a suitable amount of lime for that purpose.

It will be apparent that the principle of reaction embodied in the equation above
65 given can be employed by using other metal acid compounds or metalloid acid compounds and sulfids such as molybdenum, copper, tin, chromium, vanadium, titanium, tantalum, aluminum and uranium for the
70 production of other metals and alloys, and that the alloys are by no means restricted to alloys of but two metals. For instance, in the smelting of carbon with molybdenite and calcium molybdate, we obtain molybdenum;
75 by the smelting of carbon with molybdenite, iron sulfid and scheelite, we obtain ferro-molybdenum-tungsten; or by smelting carbon with scheelite and sulfid of copper, we obtain tungsten-copper; etc.

Instead of compounds containing calcium we may use compounds containing other bases which form suitable slags with the sulfur of the sulfid. It has likewise been
85 found that the metallic acid compounds need not be employed in the smelting operation in the form of preliminarily made products, but that they may be produced during the smelting operation from the base and the
90 metallic acid or from the oxid of the metal, by subjecting either of them together with a sulfid and carbon to the temperature of the electric furnace. In this manner, for instance, we can obtain an alloy of iron and uranium by the smelting of lime, oxid of
95 uranium, iron sulfid and carbon.

Having thus described our invention, what we claim is:

1. In the production of metals and metal alloys in the electric furnace from carbon
100 together with alkaline earth metal compounds of other metals or the constructive elements of said compounds, the method of slagging the alkaline earth metals thereof
105 by the addition of metallic sulfid to the furnace charge; substantially as described.

2. In the production of metals and metal alloys in the electric furnace from carbon together with alkaline earth metal compounds of other metals or the constructive
110 elements of said compounds, the method of slagging the alkaline earth metals thereof by

the addition of metallic sulfid and a base to the furnace charge; substantially as described.

3. In the production of metals and metal
5 alloys in the electric furnace from carbon
together with alkaline earth metal com-
pounds of other metals or the constructive
elements of said compounds, the method of
slagging the alkaline earth metals thereof
10 by the addition of metallic sulfid and lime to
the furnace charge; substantially as de-
scribed.

4. In the production of metals and metal
15 alloys in the electric furnace from carbon
together with alkaline earth metal com-
pounds of other metals or the constructive
elements of said compounds, the method of
slagging the alkaline earth metals thereof
by the addition of metallic sulfid to the fur-
20 nace charge in such proportion as not only
to slag the alkaline earth metal constituent
of the compound but to add a portion of its
own metal to the resultant metal product;
substantially as described.

25 5. In the production of metals and metal

alloys in the electric furnace from carbon
together with alkaline earth metal com-
pounds of other metals or the constructive
elements of said compounds, the method of
slagging the alkaline earth metals thereof by 30
the addition of metallic sulfid to the furnace
charge in such proportion as not only to
slag the alkaline earth metal constituent of
the compound but to add a portion of its
own metal to the resultant metal product 35
and freeing the resultant metal product
from sulfur by the further addition of a
base suitable for slagging the sulfur; sub-
stantially as described.

In testimony whereof we affixed our signa- 40
tures, in presence of two witnesses.

ALWIN NIESKE.

E. MÜLLER.

Witnesses as to Alwin Nieske:

PAUL ARRAS,

CLÄRE SIMON.

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B. DIETHELM,

TH. STANISCH.