

# UNITED STATES PATENT OFFICE.

PIERRE MANHES, OF LYONS, FRANCE.

## PROCESS OF REFINING NICKEL.

SPECIFICATION forming part of Letters Patent No. 409,992, dated August 27, 1889.

Application filed December 19, 1888. Serial No. 294,113. (No model.)

*To all whom it may concern:*

Be it known that I, PIERRE MANHES, engineer and metallurgist, a citizen of the Republic of France, and a resident of Lyons, France, have invented new and useful Improvements in the Process of Refining Nickel and Cobalt, of which the following is a specification.

By the treatment of ores in the converter I produce crude nickel and cobalt in the proportion of about ninety-seven or ninety-eight per cent., and consequently these products, in order to satisfy the requirements of the industry, must undergo a refining treatment which brings them to a state which, if not absolutely pure, is at least comparatively pure. The other processes of treating these same ores also often produce crude metals, which likewise require to be refined in order to adapt them for the uses for which they are designed. Heretofore wet processes, which are invariably long, expensive, and difficult, have been almost exclusively employed for refining nickel and cobalt.

The process which forms the subject of this invention is a dry process, which assimilates, as it were, the metallurgy of nickel and cobalt to that of other metals.

The following is a description of the operation, the details of which as a whole constitute the improved process.

On leaving the converter or the apparatus in which it has been produced the crude nickel or cobalt is cast in the form of plates, bars, or shot. In practice, however, I prefer to adopt the form of thin plates of from ten to fifteen millimeters in thickness, and I will therefore speak of plates in the following description. These plates are piled upon the sole of a furnace heated by oxidizing-flames, or in any other apparatus capable of heating the metal to a red heat in an oxidizing medium, and they are thus maintained at a temperature corresponding to a red heat for a longer or shorter time, according to the degree of purity of metal. The said time varies from six to ten hours. The oxidation can, however, be hastened, and its duration can therefore be diminished by projecting upon the plates of nickel or cobalt a little

saltpeter. Under the action of air the metal is oxidized at the surface without melting, and when this oxidation is deemed sufficient, which can be very readily seen after a little experience, the plates are removed from the furnace and allowed to cool. They are then covered with a more or less thick crust of oxide.

The oxidized plates, as has been explained, are melted either in crucibles or in a reverberatory furnace, or in any other melting apparatus, with the addition of an alkaline flux, such as potash, soda, borax, or the like; but sodium salts are preferable. During the melting the oxide on the surface of the plates reacts upon the mass of the metal by acting upon the materials which are more oxidable than nickel. The last traces of sulphur are eliminated in the state of sulphurous acid and the iron is transformed into the state of oxide. It is then that the alkaline flux acts and dissolves the oxide of iron, while it scarcely acts at all upon the oxide of nickel or cobalt. The result of the melting is therefore a comparatively pure nickel or cobalt, which is perfectly suitable for any industrial uses and a scoria which has absorbed all the oxide of iron produced, but contains only traces of nickel or cobalt.

I may observe that for the oxidation and melting two apparatus can be dispensed with by employing a reverberatory furnace upon the sole of which the crude metal is first roasted, as above described, then melted in the same furnace by simply raising the temperature sufficiently.

The foregoing description appears to be sufficient to render the reactions understood upon which the method which forms the subject of this invention is based, and the application of which to the metallurgy of nickel and cobalt constitutes a new industrial process.

I wish it understood that I reserve the right to make such modifications in this process as experience may suggest without departing from the nature of the said invention.

What I claim is—

The herein-described process of refining nickel and cobalt, which consists in casting

the crude nickel or cobalt, then oxidizing the  
surface of the castings by means of oxidizing-  
flames in the presence of air, then cooling the  
castings, and afterward melting them in the  
5 presence of an alkaline flux, substantially as  
described.

In testimony whereof I have hereunto signed

my name in the presence of two subscribing  
witnesses.

PIERRE MANHES.

Witnesses:

GEORGES FREYDIER DUBREUL,  
XAVIER JANICOT.