No. 815,717. PATENTED MAR. 20, 1906.

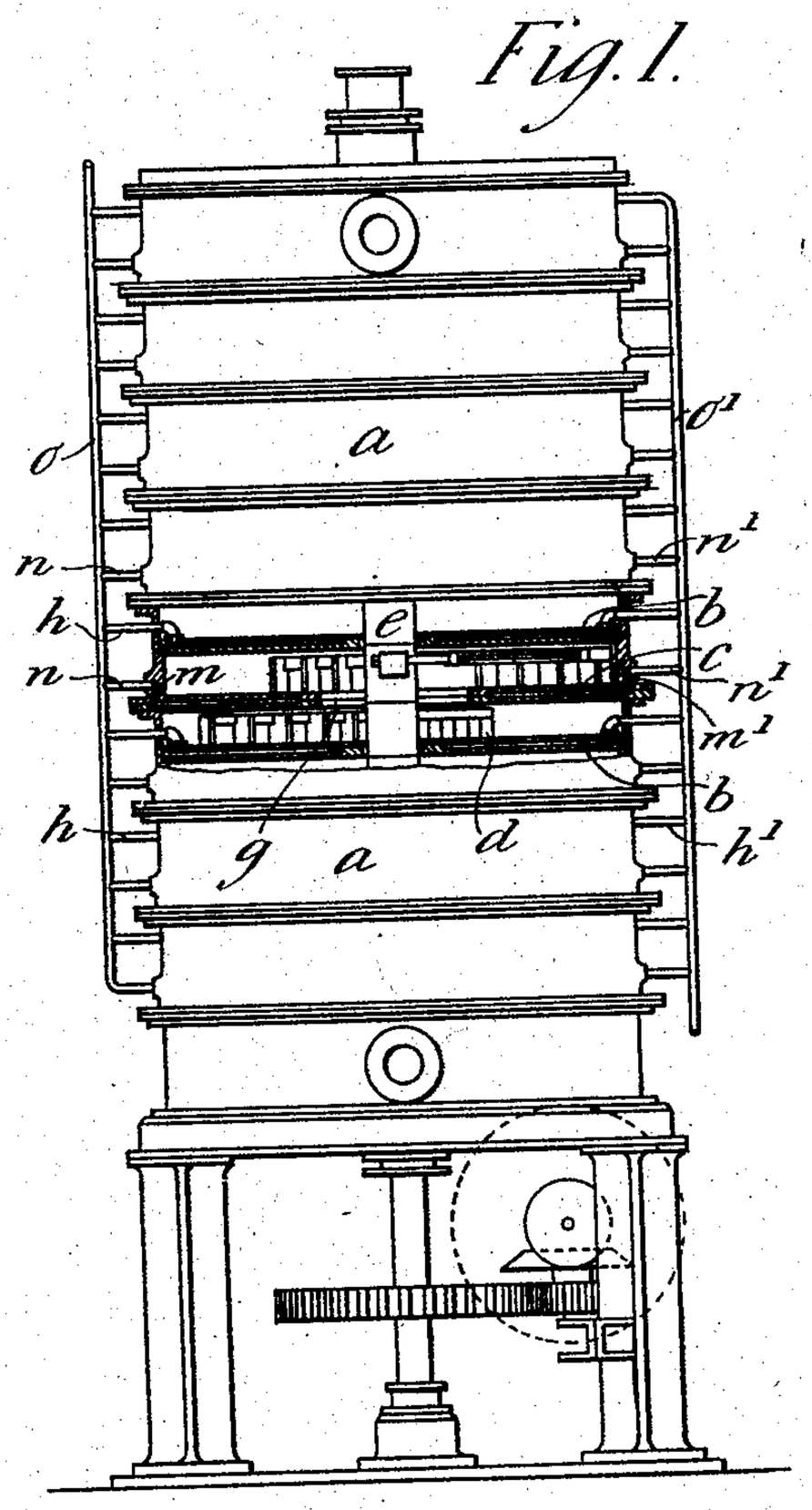
C. LANGER.

PROCESS OF TREATING NICKEL ORES.

APPLICATION FILED JULY 8, 1905.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
Jas. A. Morro, Jr.
C. J. Kesler

Inventor
Carl Langer
By James L. Norris
Atty.

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2 SHEETS—SHEET 2.

Fig. 2.

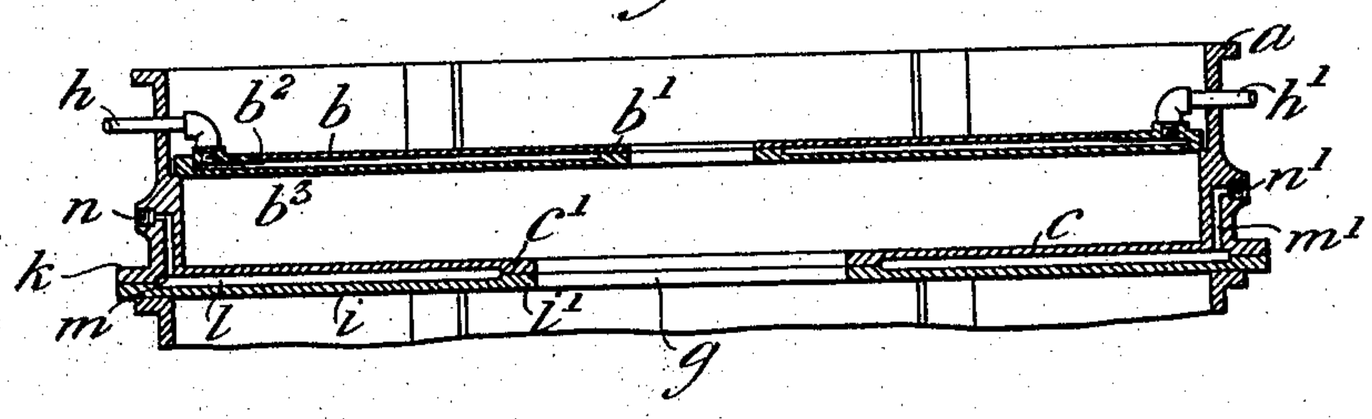
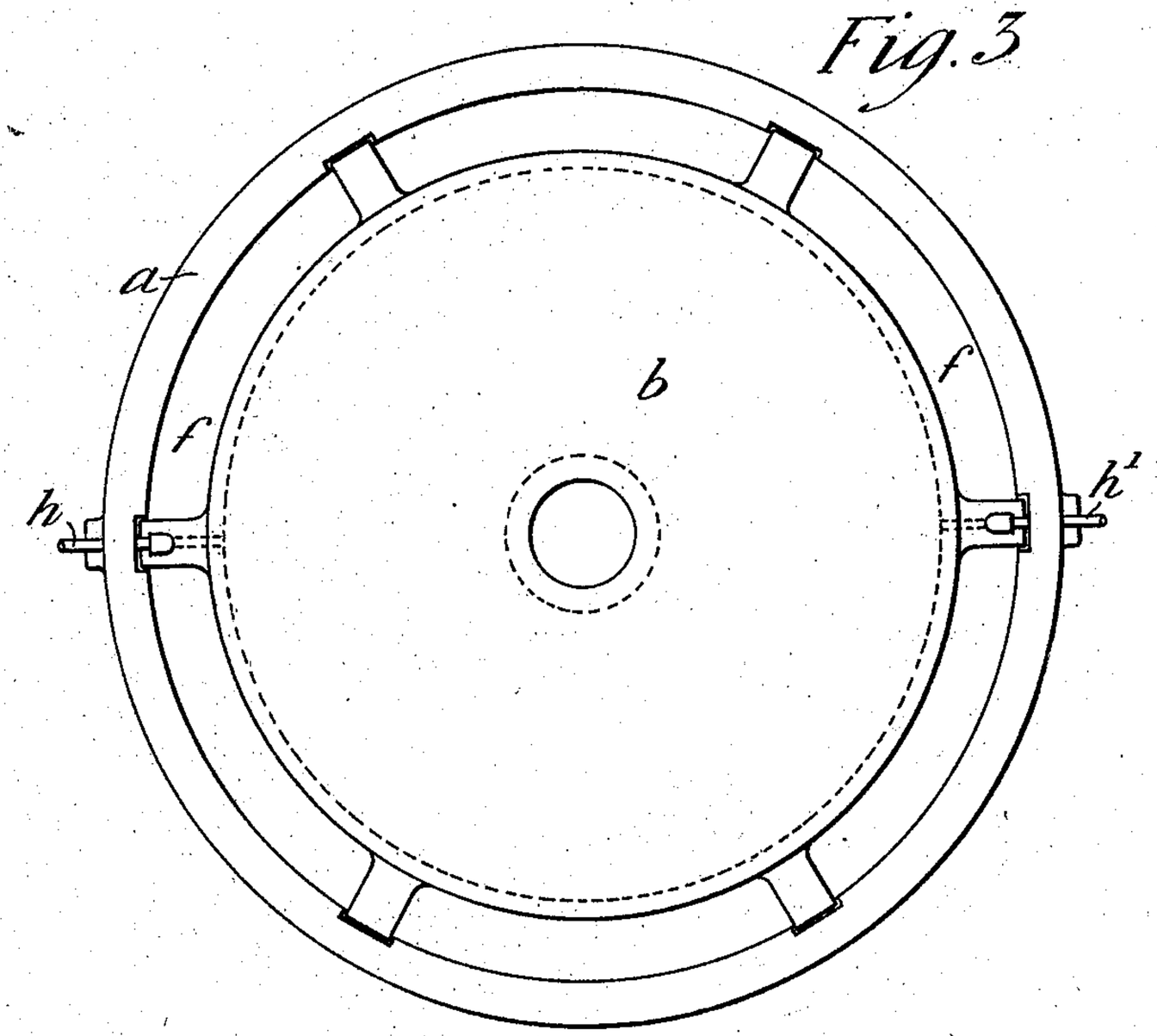


Fig. 3



Witnesses:

James L. Norris, Jr.

C. D. Kesler

Inventor

Carl Langer

By James L. Norris.

Attys.

UNITED STATES PATENT OFFICE.

CARL LANGER, OF YNSPENLLWCH, CLYDACH, ENGLAND, ASSIGNOR TO THE MOND NICKEL COMPANY, LIMITED, OF WESTMINSTER, ENGLAND.

PROCESS OF TREATING NICKEL ORES.

No. 815,717. Specification of Letters Patent. Patented March 20, 1906.

Application filed July 8, 1905. Serial No. 268,859.

To all whom it may concern:

Be it known that I, CARL LANGER, manufacturing chemist, a subject of the King of Great Britain, residing at Ynspenllwch, Clydach, in the county of Glamorgan, England, have invented certain new and useful Improvements in Processes of Treating Nickel Ores, of which the following is a specification.

In specification of United States Patent No. 551,220, dated December 10, 1895, is described the now well-known process for obtaining nickel which consists in heating oxid of nickel or material containing that oxid in a reducing-gas at a temperature between 350° and 500° centigrade, allowing the material to cool and subjecting it to the action of a stream of carbonic-oxid gas whereby the nickel is volatilized in the form of nickel carbonyl. Now it is stated in the said specification that 50° centigrade is the temperature preferred by the inventor as that at which the treatment with carbonic oxid should occur, but that if the operator prefers to allow the reduced material to cool to ordinary atmospheric temperature he can do so, inasmuch as it is possible to work at temperatures from 0° to 150° centigrade. In practicing the process on a manufacturing scale varying and low yields of nickel carbonyl have been obtained, and as a result I have discovered that this is because the aforesaid statement as to the permissible range of temperature is very much too wide when working at atmospheric pressure. So far from its being possible to work at any temperature within the range of 0° to 150° centigrade at atmospheric pressure my experiments have proved that it is essential to keep the temperature of the material between 40° and 50° centigrade at atmospheric pressure in order to obtain the best extraction of nickel or, indeed, such an extraction as will make the process commercially successful. Moreover, merely allowing the material under treatment to cool to 50° centigrade is quite useless in practice, for the reaction between nickel and carbonic oxid evolves heat, so that the temperature of the material rapidly rises again. My experiments have shown that the heat evolved by the reaction raises the temperature of the material locally, so that for maintaining the temperature between the limits stated it is impossible to rely only upon natural radiation of this heat from the apparatus.

My invention relates to processes wherein the material under treatment with carbonic oxid is kept at a temperature between 40° and 50° centigrade by means of artificial cooling. This may be done in a variety of ways. Seeing, however, that the adjustment of temperature is chiefly required locally in the apparatus, I prefer to pass or allow to pass a fluid, the function of which will generally be to cool the material so as to counteract the heat evolved by the reaction through passages in the apparatus, around or over which passages the material under treatment is moved.

To illustrate the preferred form of my invention, I will describe an apparatus which is an adaptation for the purposes of my invention of the volatilizer described in specification above referred to.

In the accompanying drawings, Figure 1 is an elevation of the volatilizer, partly in section. Fig. 2 is a vertical section; and Fig. 3 a plan of one chamber, drawn to an enlarged scale.

The general construction of the volatilizer is similar to that described in the said specification—that is to say, it consists of a number of short vessels *a*, preferably cylinders superimposed on each other and constituting a number of chambers divided by a partition *b* and having a bottom *c*. The material is caused by stirrers *d*, carried by a rotating shaft *e* to travel over the partition *b* from the center to the circumference, whence it falls through openings *f* onto the chamber-bottom *c*, where it is made to travel by the stirrers from the circumference to the center, whence it falls through the openings *g* onto the partition of the next lower chamber. According to this invention the partitions *b* are made hollow. In the instance shown they are made of two plates, making joint at b' and b^2, with the aid of suitable packing, and having a space b^3 between them, into which water or other suitable liquid or gas may pass through a pipe *h*, flowing out again through a pipe h'. To provide a space in the bottom of the chamber, the bottom *c* has a rim c' on its under surface, which rests on a similar rim i' on the upper surface of a plate *i*, supported

on the top of the next lower cylinder. The lower flange *k* of the cylinder *a* rests on the edge of the plate *i* and a suitable packing makes a tight joint between the rims *c'* and *i'* and between the flange *k* and the plate *i*. A space *l* is thus formed below the bottom *c*, into which water or other suitable liquid or gas may pass through a pipe *n*, Fig. 1, and a channel *m* to flow out again through a channel *m'* and a pipe *n'*, Fig. 1. All the inlet-pipes *h* and *n* are connected with the main *o*, while all the outlet-pipes *h'* and *n'* are connected with the main *o'*.

In working the volatilizer water, air, or other suitable cooling medium is passed through the pipes and spaces in such quantity that the material under treatment is maintained at the most suitable temperature.

Having thus described the nature of this invention and the best means I know of carrying the same into practical effect, I claim—

1. A process for volatilizing nickel in the form of nickel carbonyl, which consists in passing carbon monoxid over finely-divided nickel and keeping the temperature of the said nickel at between 40° and 50° centigrade.

2. A process for volatilizing nickel in the form of nickel carbonyl, which consists in passing carbon monoxid over material containing finely-divided nickel and keeping the temperature of the said material at between 40° and 50° centigrade.

3. A process for volatilizing nickel in the form of nickel carbonyl, which consists in passing finely-divided nickel over passages, passing through the passages a fluid adapted to keep the temperature of the said nickel at between 40° and 50° centigrade and passing carbon monoxid over the said nickel.

4. A process for volatilizing nickel in the form of nickel carbonyl, which consists in passing material containing finely-divided nickel over passages, passing through the passages a fluid adapted to keep the temperature of the said material at between 40° and 50° centigrade and passing carbon monoxid over the same material.

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

CARL LANGER.

Witnesses:
OLIVER IMRALL,
G. F. WARREN.