(No Model.)

H. A. SPEARS.

Process of Smelting Ores Containing Iron and Precious Metals.

No. 241,164. Patented May 10, 1881.

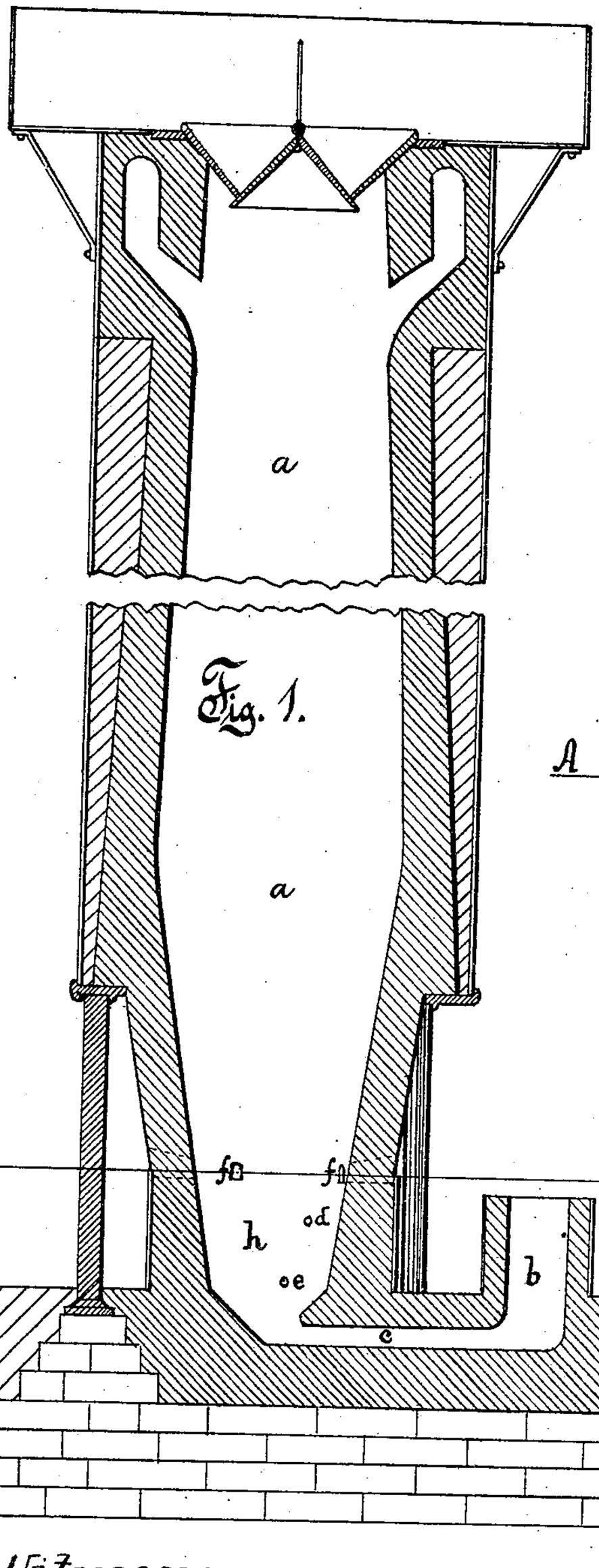

Fig. 1.

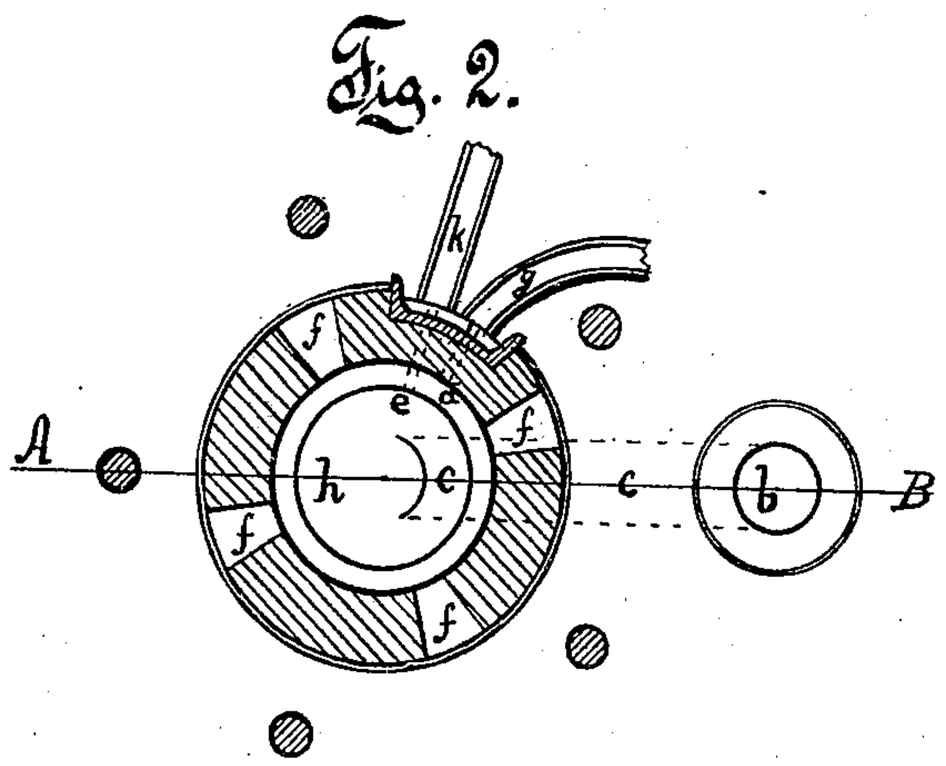

Fig. 2.

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HENRY A. SPEARS, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF, IRA HERSEY, AND JOHN J. READ, BOTH OF SAME PLACE.

PROCESS OF SMELTING ORES CONTAINING IRON AND PRECIOUS METALS.

SPECIFICATION forming part of Letters Patent No. 241,164, dated May 10, 1881.

Application filed March 2, 1881. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. SPEARS, a citizen of the United States, residing in the city, county, and State of New York, have invented a new and valuable Improvement in the Method of Smelting Iron Ores Containing the Precious Metals, as will be hereinafter fully described, and particularly pointed out in the claim.

I obtain both the precious metals, lead, and pig-iron separated, and each in commercial form; and I do hereby declare that the following is a full, clear, and exact description of the operation and construction of the same, such as will enable those skilled in the art to which it pertains to make and use it, reference being had to the annexed drawings, which are made a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a vertical section of a closed-front and closed-top iron blast-furnace adapted to carry out my process. Fig. 2 is a horizontal section of the same on the line A B.

Similar letters of reference in each refer to similar parts.

In the annexed drawings, *a*, Fig. 1, is the shaft of a closed-front and closed-top iron blast-furnace of ordinary construction, and therefore unnecessary of further description here. *h* is the hearth or crucible of the furnace, built with a very concave or deep bottom.

b is a well, separate from the furnace proper and from the working-front, but connecting with concave hearth *h* by the inclosed conduit *c*.

d and *e* represent the approximate location, respectively, of the tapping-holes for slag and pig-iron.

f represents the approximate location of the tuyere-arches, not limited, however, to any specific number.

g and *k* (shown in Fig. 2) represent, respectively, what are known as "slag" and "iron" troughs in their approximate position as regards the well *b*.

My invention relates to the smelting of iron ores containing the precious metals or ores containing iron and the precious metals; and the object of my invention is the working of such ores to save the iron and the precious metals at one operation, something hitherto not done.

The operation of smelting such ores in a blast-furnace as described is as follows: When the furnace is blown in, metallic lead is charged with the iron ore and the proper fluxes. The lead, melting first, will find its way to the hearth, and through the conduit *c* to the well *b*. The quantity of lead in the hearth is kept at its proper level by dipping out or tapping the excess from well *b*. The charges of ores, fluxes, and fuel are kept up, as in the ordinary practice of iron-smelting, with the addition from time to time of charges of lead, as may be required. In this manner iron-smelting will go on as in the ordinary course, while any precious metal contained in the ore will, when smelted, be taken up by the lead and drawn from the well in form of base bullion. The lead taken from the well can be returned through the furnace again and again until the resulting bullion is found to be sufficiently rich for market. The ordinary operations of iron-smelting go on independently of the bullion product, and, as shown, at a separate part of the furnace.

I do not confine myself to the use of metallic lead, but would use suitable ores of lead, such as can be had, or which, by roasting or otherwise, can be sufficiently freed from sulphur or other impurities, which would alloy with the iron to its detriment.

By the above means I propose to avail myself of the known qualities of lead as a separator of metals without injury to the iron as made in a high blast furnace.

I am well aware that blast-furnaces have been constructed with what were known as two hearths—viz., the main hearth or crucible and the fore or working hearth—and that such practice was, until recent years, universal; but the same is now obsolete, and when used was for a different purpose.

I am also aware that in some lead-furnaces a well is used from which the metal is taken out; but in all such cases the fore hearth or well is a part of and connected directly with the working-front of the furnace; but I do not know that it has ever been proposed or put into practice to use a well or crucible separated from and entirely disconnected from the work-

ing-front of a closed-front iron blast-furnace for the purpose of producing pig-iron and base bullion in the same furnace at one and the same time.

What I therefore claim as new, and for which I desire to secure Letters Patent, is—

The process of obtaining iron and precious metals in commercial form at one operation, which consists in smelting, in a blast-furnace, the ores containing such metals, together with suitable charges of lead or ores carrying lead, and tapping off separately the pig-iron and base bullion, substantially as described.

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