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PATENTED MAR. 17, 1903.

O. FORSBACH & E. CLERC.
CRUCIBLE SMELTING FURNACE.

APPLICATION FILED JAN. 24, 1901.

NO MODEL.

Fig. 1.

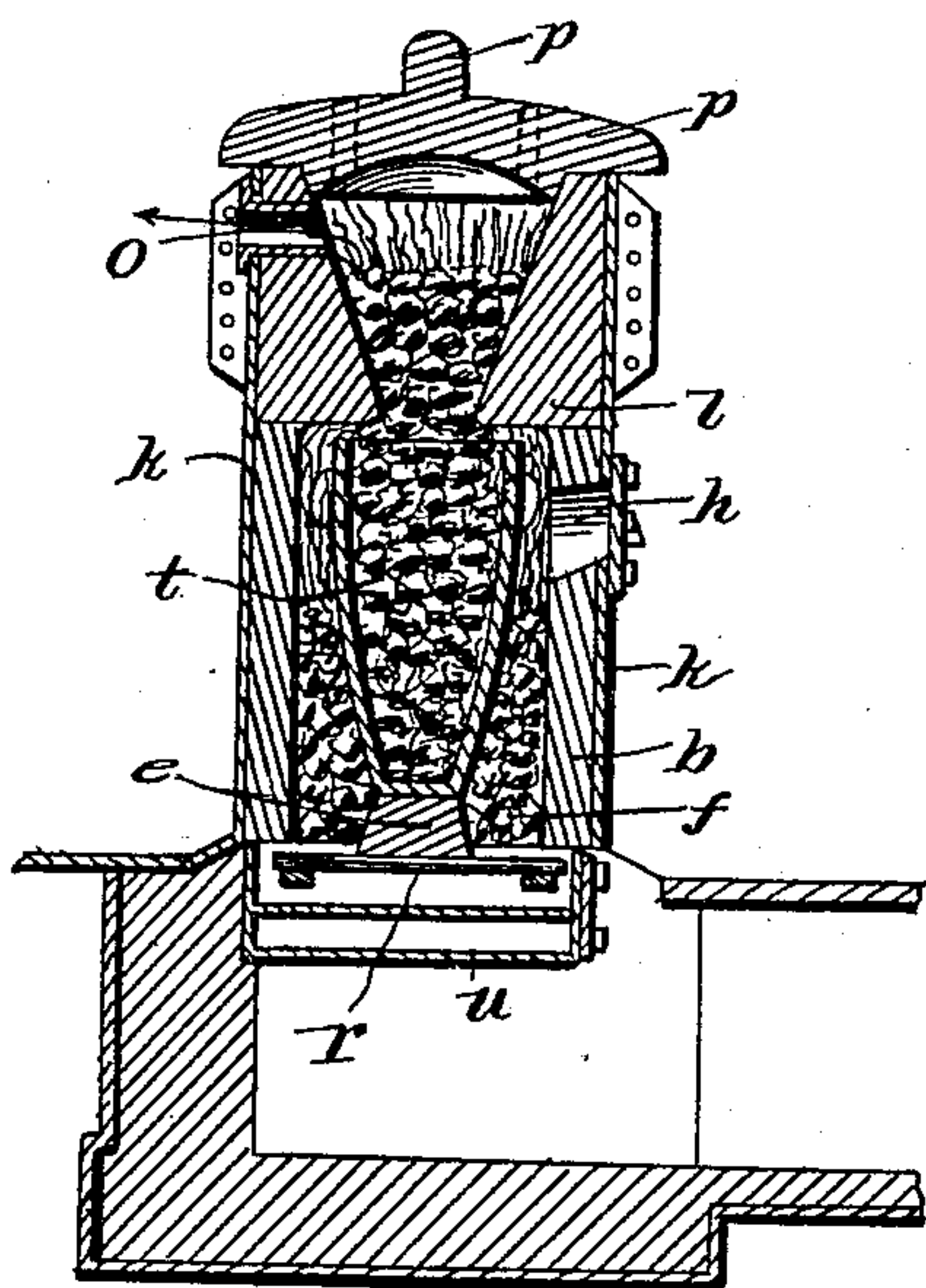


Fig. 2.

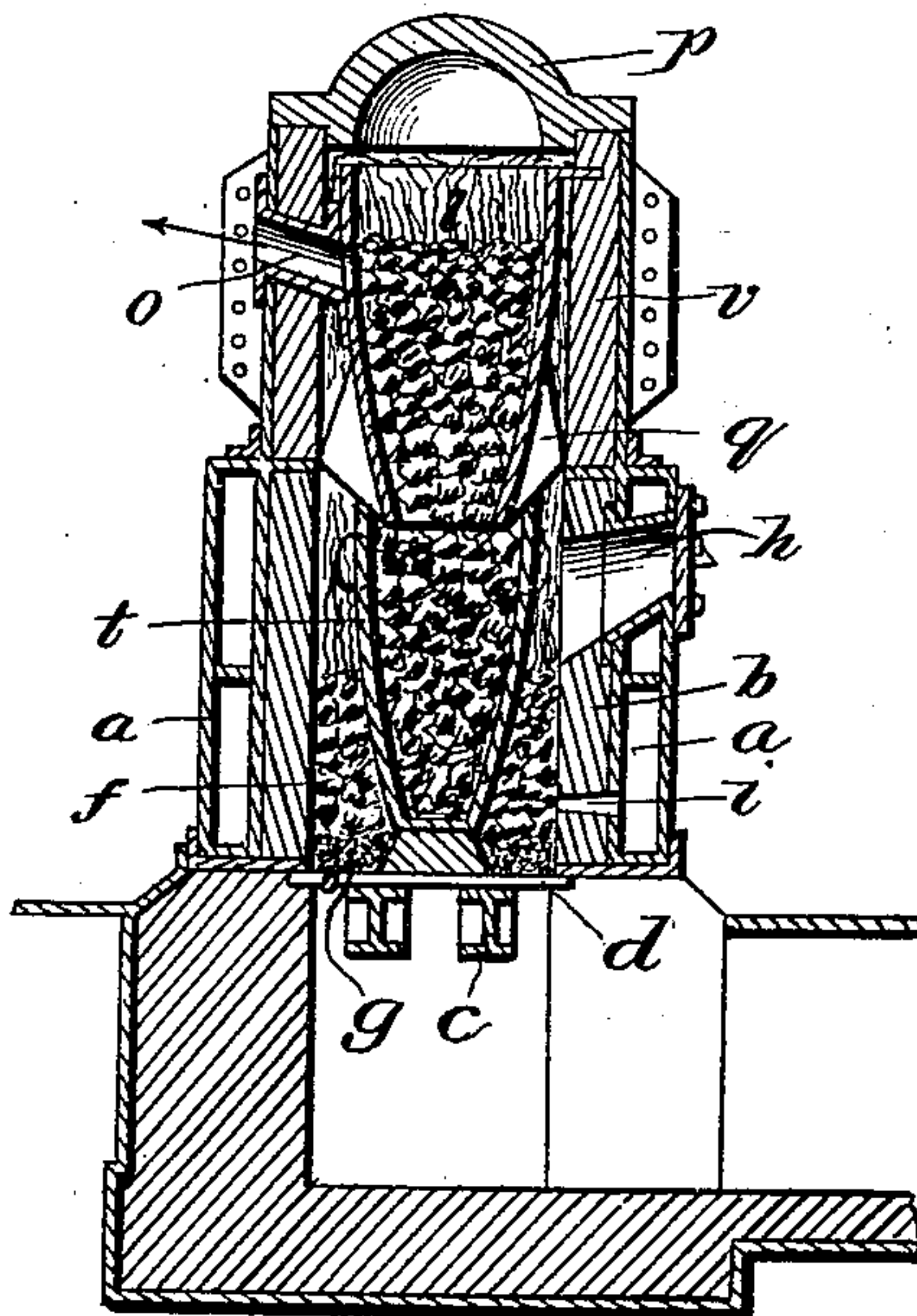


Fig. 3.

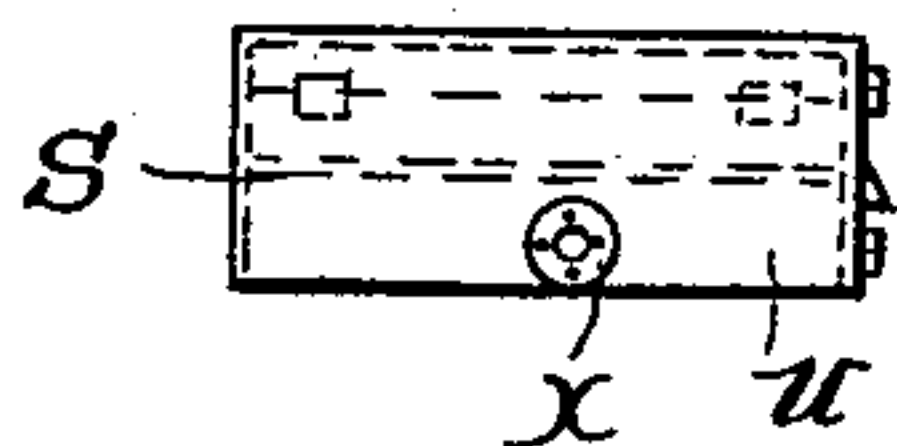


Fig. 4.

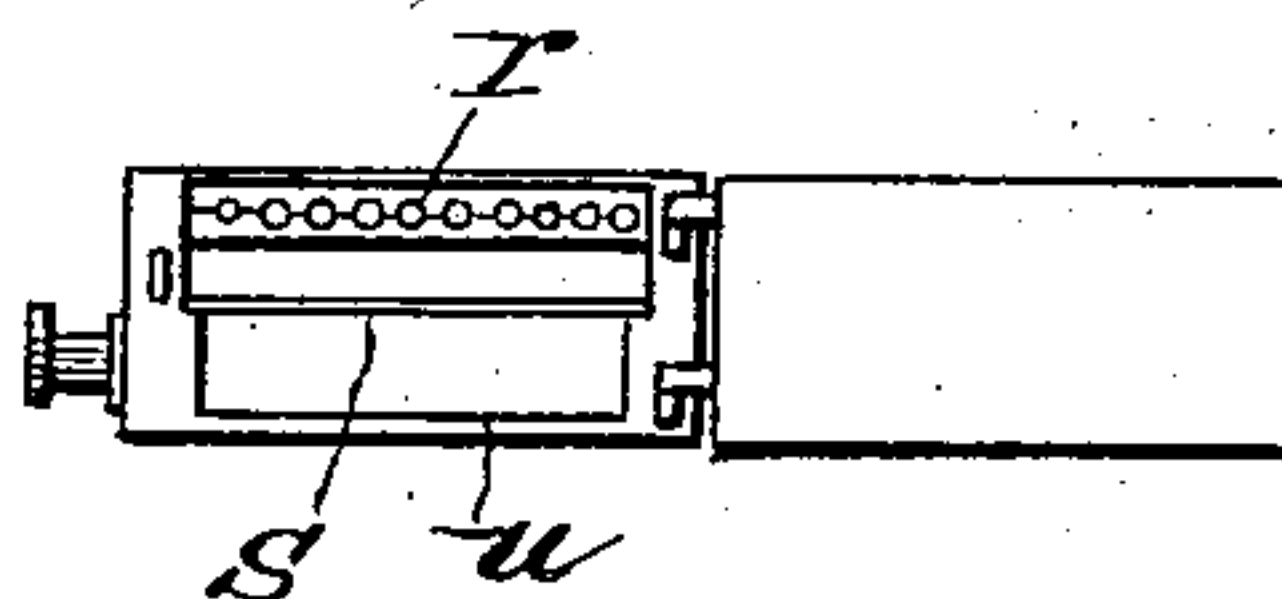
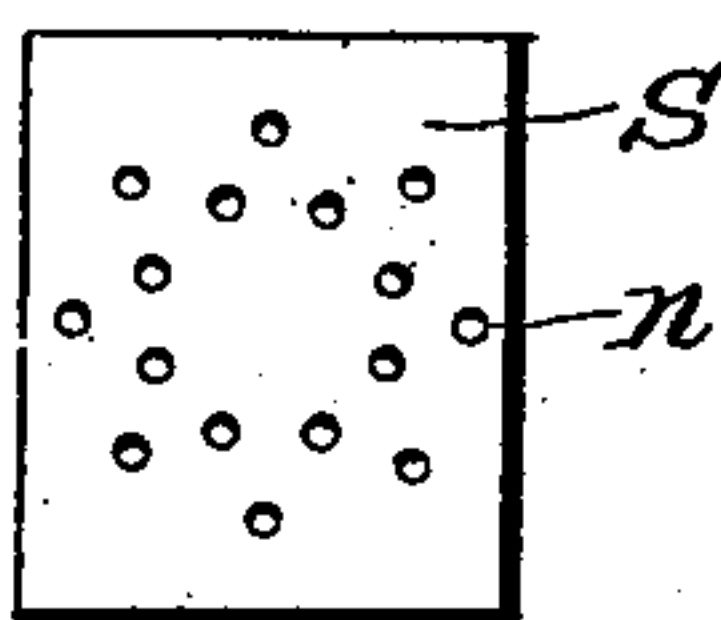


Fig. 5.



Witnesses

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CRUCIBLE SMELTING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 722,831, dated March 17, 1903.

Application filed January 24, 1901. Serial No. 44,507. (No model.)

To all whom it may concern:

Be it known that we, OTTO FORSBACH and EDUARD CLERC, subjects of the Emperor of Germany, residing at Mülheim-on-the-Rhine, Rhineland, Germany, have invented certain new and useful Improvements in Crucible Smelting-Furnaces, of which the following is a specification.

In the crucible smelting-furnaces hitherto known the heating-gases either played around the crucible containing the substance to be smelted, the said crucible being in this case over the fire in the furnace, or the heating-gases were conducted through the substance to be smelted, the crucible in this case being above the furnace and a receiving-crucible being provided for the melted substance.

According to the present invention the furnace is so constructed that the smelting takes place simultaneously in two crucibles, around one of which the heating-gases play, the latter after imparting part of their heat to the first crucible or the substance therein being conducted partially around the second crucible and partially through the same before arriving at the chimney. The heating-gases are thus more thoroughly utilized, the smelting is effected more rapidly, and when the substance to be smelted has once been put in and the furnace set going the latter requires hardly any attendance.

In the annexed drawings, Figure 1 is a vertical sectional view of our invention. Fig. 2 is a like view of a modification. Fig. 3 is an end view of the supporting-frame for the crucible-receptacle. Fig. 4 is a side view thereof. Fig. 5 is a plan view of the perforated plate within the supporting-frame.

The furnace represented by Fig. 1 comprises two parts placed one above the other, both the upper and the lower part being surrounded by a single sheet-metal jacket *k*. Within this jacket and held together by the same are fire-brick jackets *b* and *l*, of which the former surrounds the crucible and grate and the latter forms in itself a receiving pot or chamber receptacle in the shape of an inverted truncated cone open at the bottom. The crucible-receptacle *t* rests upon a base or frame *u*, supporting at its upper part a grate *r*, consisting of fixed or loose bars.

The heating can be effected in any suitable manner; but as a rule it will be done by coke-firing, and this method is represented in the drawings, the lower part of the lower crucible *t* being surrounded by a layer of coke.

In the sheet-metal and fire-brick jackets *b* a suitable number of inclined openings *h* are provided near the top for the purpose of inserting coke without interrupting the smelting process, the said openings being closed from the outside by means of lids, doors, or the like.

The upper part of the furnace consists of a removable and portable or tiltable fire-brick receiving-pot *l*, surrounded by a metal jacket *k*, this receiving-pot, like the one inside the furnace, serving to receive the material to be smelted. At the upper part of this receiving-pot and at the side thereof a channel *o* is provided to conduct the heating-gases to the chimney; and the crucible is provided at the top with a removable well-fitting cover *p*, having a handle *p'*.

The method of using this furnace is as follows: When the fuel has been ignited, the smelting-crucible *t* is inserted and the space around the latter is filled with coke. Thereupon the receiving-pot is put into position and the gaps between the bottom of the said crucible and the iron ring upon the lower part are closed with clay. The crucible having been inserted full of material, the receiving-pot is now filled to the required extent and the cover *p* put on and well closed. The receiving-pot can also be put on already filled. The flame and furnace-gases first heat the smelting-crucible, then rise and pass along same and mingle above it with the vapors and gases generated therein by the smelting. They then pass on their way to the chimney or the channel *o* through the material in the receiving-pot and smelt that also. The smelted material accumulates in the lower crucible. In charging the crucibles the quantities are so calculated that after smelting the lower crucible will be sufficiently filled, so that during the process they need not be recharged and the furnace requires no attendance except for replenishing with fuel. This constitutes a very considerable technical advance. As the furnace need not be opened

during the smelting process and no heat is lost, the smelting process is more rapid and requires less fuel.

The smelting material in the receiving-pot 5 can be kept in place either by the shape of the latter, especially the narrowing of its lower opening, or by wedging in large pieces. By this arrangement the space between the upper edge of the lower crucible and the lower 10 opening of the receiving-pot remains completely free.

For discharging the furnace the upper part is removed and the crucible taken out.

The furnace represented in vertical section 15 in Fig. 2 is more particularly intended for the smelting of filings, brass rubbish, and the like and generally for smaller purposes. The lower part of this furnace is similar to that of the one described hereinbefore, except that 20 it is provided with a chamber *a*, formed by two sheet-metal jackets, which chamber contains compressed air to be conducted to the fire, and that it rests upon a pivoted plate or the like *d*, carried by supports *c*. The upper 25 part of this furnace is slightly different. The fire-brick crucible *l* is surrounded by a fire-brick jacket *v* of the same diameter as the fire-brick jacket *b* of the lower part and closed at the top by a cover *p*. The outer wall of 30 the upper crucible is provided with supporting-plates *q*, between which the heating-gases pass, so that the heating-gases do not pass through the upper crucible, but around it. The said gases accumulate above the upper 35 crucible *l* under the cover *p* and must then, in order to reach the chimney through the channel *o*, enter the upper crucible *l*, thus passing through part of the material to be smelted. The heating-gases thus play around 40 both crucibles and must pass through a portion of the upper one before they can escape. The method of using this form of the furnace is exactly identical with that of the form first described. The upper crucible can either be 45 put on by itself or with its jacket.

The two crucibles are charged in exactly the same manner as described with reference to the other form of the furnace; but the annular space between the fire-brick jacket *b* 50 and the cone of fire-bricks *e* is filled with a layer *g* of clay or wet sand or the like in order to prevent the entrance of air at the edge of the floor-plate *d* and to protect the latter from overheating. Upon this layer of clay 55 or the like a layer of coke *f* lies. The entrance of compressed air from the chamber *a* takes place through a number of tapering horizontal pipes or channels *i*, having their smaller ends adjacent to the crucible. When 60 the supports *c* have been removed, the plate *d* can be turned down and slag and the like removed.

In many cases it is desirable to obtain a fine flame by the combustion. This is achieved

by means of the following arrangement, (represented in Figs. 3 to 5:) Instead of the plate 65 *d* closing the lower orifice of the furnace, Fig. 2, a base or frame can be used, as described in connection with Fig. 1, the said base being suitably mounted below the fire- 70 brick *b* and carrying at the top a grate *r*. At the side of the frame *u*, which is closed on all sides, is a tube *x*, through which air is pressed in. At half the height of the frame 75 and above the air-admitting tube the former contains a plate *s* with perforations *w*. Both the number and size of the holes *w* can be chosen at will and depend upon the purpose in view. The air admitted by the tube *x* is 80 compelled to pass through the holes in the plate *s* and is heated in doing so, and also while in the space between the said plate and the grate *r* and in passing through the grate and the fuel produce a fine flame. This base 85 or frame *u* owing to its location becomes heated, and consequently the air in passing there-through is heated before entry into the furnace. When the base *u* is employed, the plate *d* and the channels *i* are dispensed with.

Having now particularly described and as- 90 certained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is—

1. In a crucible smelting-furnace, a crucible suitably supported above the grate-bars 95 with a receiving portion arranged above the crucible and communicating therewith, the receiving portion having an outlet extending thereinto above the material in the receiving portion, a cover arranged on the receiving 100 portion, means for permitting the fuel to be fed around the crucible, the heat rising from the fuel, entering the receiving portion, directly engaging the material in the receiving portion previous to its exhaust through the 105 said outlet, substantially as described.

2. In a crucible smelting-furnace, a crucible suitably supported above the grate-bars, a jacket surrounding the crucible, a receiving-pot carried by the jacket and communi- 110 cating with the crucible, there being a slight space between the lower end of the receiving-pot and the upper end of the crucible, an outlet located in the side of the receiving-pot and a cover carried by the pot, the fuel be- 115 ing located around the crucible and the heat rising and entering in the said space between the crucible and receiving-pot, passing through the material in the pot and exhausting through the outlet, substantially as de- 120 scribed.

In witness whereof we have hereunto set our hands in presence of two witnesses.

OTTO FORSBACH.
EDUARD CLERC.

Witnesses:

JOHANN WELLER,
CHARLES LESIMPLE.