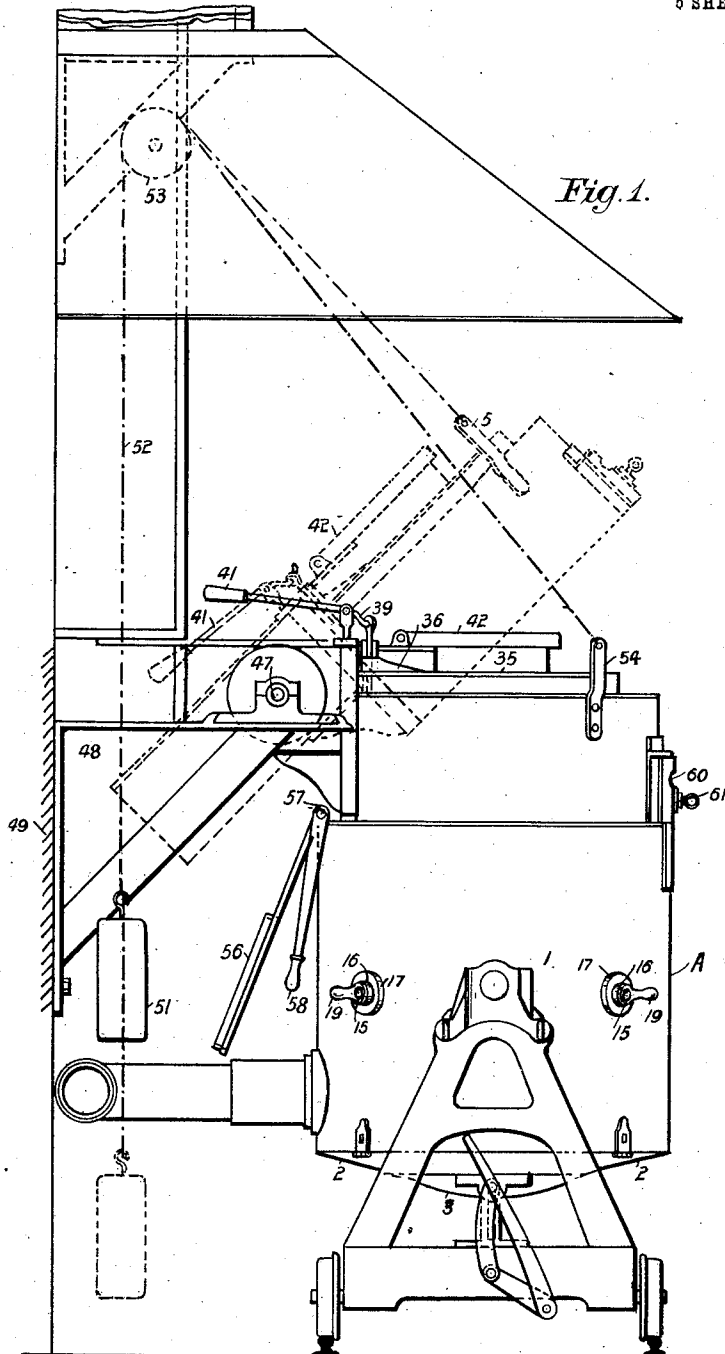


M. HARVEY.  
 PORTABLE CRUCIBLE FURNACE.  
 APPLICATION FILED JAN. 24, 1911.

1,062,970.

Patented May 27, 1913.

5 SHEETS—SHEET 1.



Witnesses

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John C. Sanders

Inventor

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 BY *Matthew Harvey*  
 ATT.

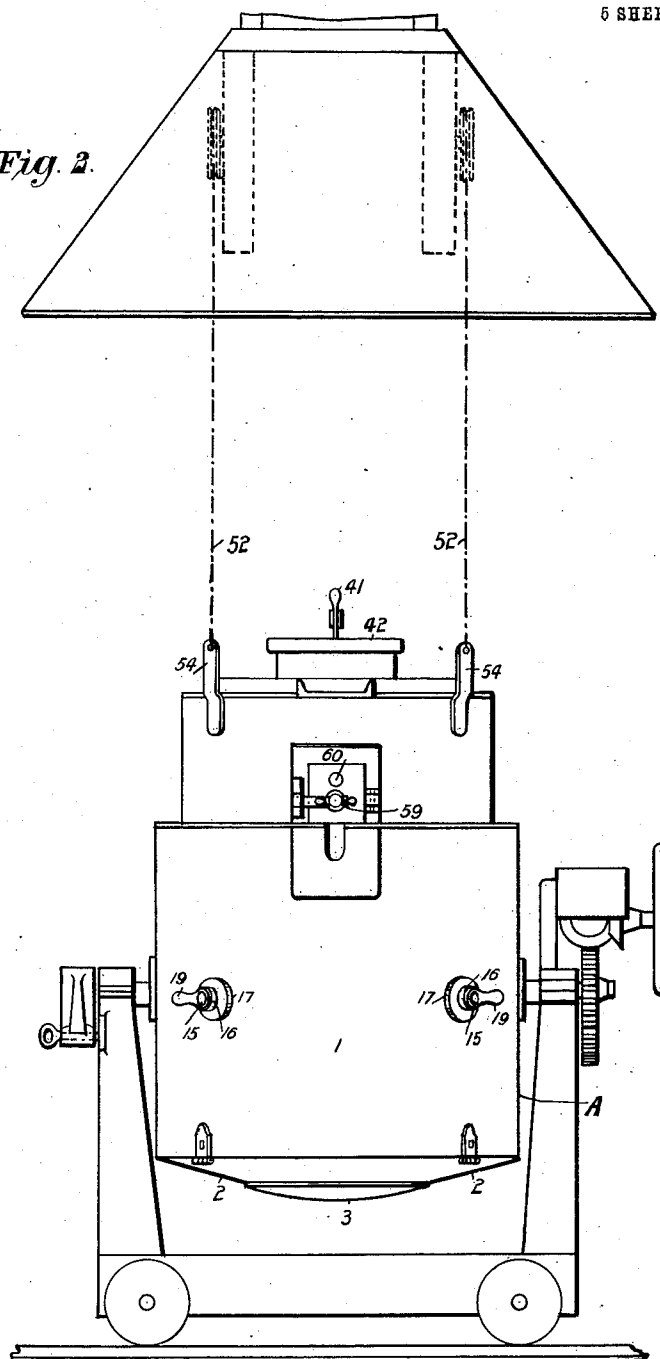
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5 SHEETS-SHEET 2.

Fig. 2.



Witnesses

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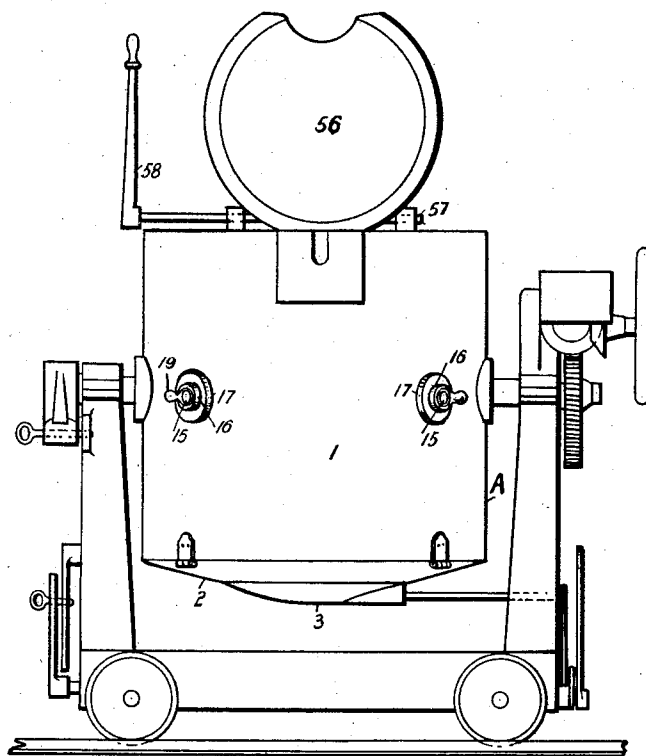
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6 SHEETS—SHEET 3.

Fig. 3.



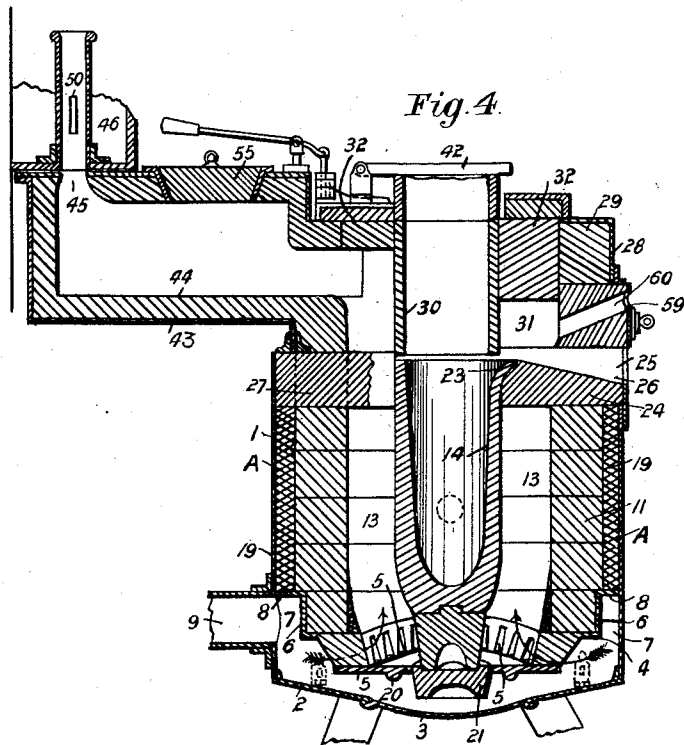
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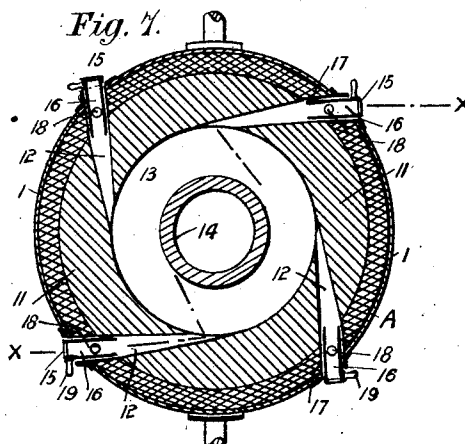
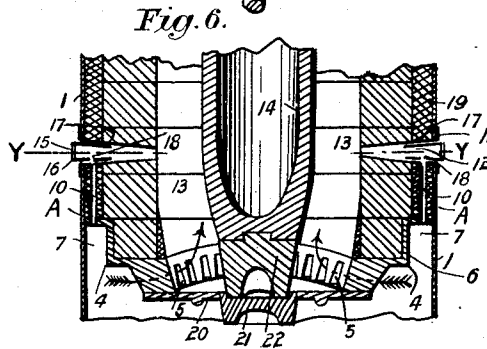
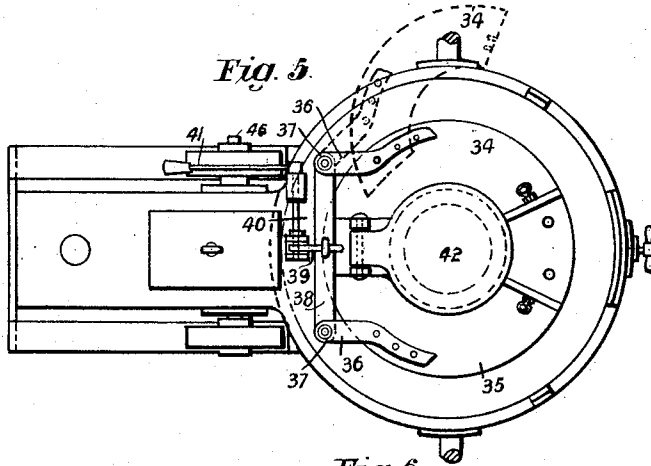
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Patented May 27, 1913.

5 SHEETS—SHEET 5.



Witnesses

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ATTY

# UNITED STATES PATENT OFFICE.

MATTHEW HARVEY, OF WALSALL, ENGLAND.

## PORTABLE CRUCIBLE-FURNACE.

1,062,970.

Specification of Letters Patent.

Patented May 27, 1913.

Application filed January 24, 1911. Serial No. 604,382.

*To all whom it may concern:*

Be it known that I, MATTHEW HARVEY, a subject of His Majesty the King of Great Britain and Ireland, residing at Glebeland Works, Walsall, in the county of Stafford, England, managing director of a limited company, have invented new and useful Improvements in Portable Crucible-Furnaces, of which the following is a specification.

10 This invention has reference to portable crucible furnaces and particularly to those of the kind in which the furnace proper containing the crucible is carried by and adapted to swing about side trunnions when  
15 pouring the melted metal out of the crucible, or for the purpose of turning the furnace upside down for examination and cleaning of the blast passages or for relining of the bottom of the furnace.

20 My present invention comprises the improvements hereinafter described whereby a crucible furnace of the type before referred to is adapted for melting iron and steel or other metals which require a high  
25 temperature.

I will describe my improvements by referring to the accompanying drawings on which—

30 Figure 1 is a side elevation of a portable crucible furnace constructed according to my present invention; Fig. 2 is a front elevation of the same, such parts only being shown as are necessary to illustrate my invention; Fig. 3 is also a front elevation of the portable crucible furnace removed from the feed heater part; Fig. 4 is a sectional  
35 side elevation of the main portions of the said portable crucible furnace; Fig. 5 is a plan of the same; Fig. 6 is a sectional elevation of part of the same taken on line X X of Fig. 7, which is a sectional plan of the furnace taken on line Y Y of Fig. 6.

40 In carrying out my present invention the furnace proper A is made with one preferably circular metallic shell 1 carrying an annular bottom plate 2 and ash pan 3 which latter is hinged to the annular bottom plate 2 and furnished with suitable fastenings not shown on my drawings. Fixed a short distance above the annular bottom plate 2 there  
45 is an annular blast plate 4 made with radial blast passages 5 through which the blast passes to the interior of the furnace at the bottom of the crucible as indicated by the arrows in Figs. 4 and 6. This annular  
50 blast plate 4 has an upwardly projecting

rim 6 of smaller diameter than the shell 1, thus leaving an annular blast space 7 between the upwardly projecting rim 6 and the shell 1. At the top of the rim 6 there  
60 is a flange 8 which is fixed to the interior of the shell 1 above the blast inlet pipe 9 so that the annular space 7 between the rim 6 and the shell 1 together with the space within the annular bottom plate 2 and ash  
65 pan 3 forms a blast chamber from which there are any convenient number, say four, of upwardly projecting blast holes or passages 10 (see Figs. 6 and 7) in the furnace lining which communicate with tangential  
70 twyer holes 12 in the brick lining 11 through which twyers 12 the blast passes to the coke in the annular space 13 around the crucible 14 so that by this means the blast is directed on to the fuel at about half way up  
75 the crucible 14 as well as through the holes 5 on to the bottom of the crucible. In the outer shell 1 there are eight or pricking holes corresponding with the twyers 12 and covered  
80 by suitable talc covers 15. The blast issuing up the vertical blast passages 10 through the twyers 12 is regulated by suitable twyer cocks each of which can conveniently consist of a hollow taper horizontal  
85 plug 16 adapted to turn in a corresponding taper tubular body 17 which is fixed in a hole in the shell 1 and projects into the firebrick lining 11, this body having an inlet hole at its lower side corresponding with the blast inlet passages 10. There is also a  
90 corresponding hole 18 in the side of the plug 16 which latter at its outer end is closed by a talc cover 15. The plug 16 has a side handle 19 by which it can be turned so as either to allow the blast to pass through  
95 the hole 18 along the twyer passage into the furnace or to partially or wholly cut off the blast.

The annular blast plate 4 carries the firebrick lining 13 between which and the outer  
100 casing 1 there is a packing of asbestos 19<sup>a</sup> or other suitable bad heat conductor. The twyers 12 are by preference arranged in tangential positions as shown in Fig. 7, so that the blast will circulate around the interior walls of the melting chamber 13 instead of impinging directly on to the crucible 14. Removably fixed to the bottom of the annular blast plate 4 there is a door or ash plate 20 carrying the refractory block  
105 21 which carries the crucible stand 22.

The crucible which is used in the furnace

is by preference of the ordinary kind made with one pouring spout 23 which as usual fits in a corresponding recess in the spout brick 24 at the top of the firebrick lining, the spout groove 25 in the spout brick being made to slope downwardly sufficiently to allow the slag to be blown out through the pouring hole 26. Or if desired the crucible can be made with two spouts one of which will be at the back opposite to the spout 23 and forming a slag spout arranged at a slightly lower level than the pouring spout 23 and in this case the key brick 27 at the back of the furnace will be made with a slag hole so that the slag can be blown out through this hole instead of being blown out through the spout brick 24. This arrangement of the crucible with two spouts however forms no part of my invention.

At the top of the furnace proper A I provide a feed heater comprising a circular casing 28 lined with firebricks 29 and forming a continuation to, but separate from, the firebrick lining 11 of the furnace proper A, the lining 29 being carried by suitable key bricks as will be readily understood. In this lining 29 of the extension part 28 there is a feed heater cylinder 30 which may be part of an old crucible arranged immediately above the crucible 14 and carrying the metal which is not yet melted and which is to melt and work down into the crucible. There is an annular fuel space 31 around this feed heater cylinder 30 and within the firebrick lining 29, and this space is filled with a charge of coke or other fuel, which as the fuel burns away around the crucible 14 is heated thereby and gradually falls down into the annular space 13 around the crucible and thus no cold fuel comes in contact with the crucible 14 and the danger of the latter cracking through contraction is obviated and the life of the crucible is considerably prolonged. It will be understood that the bricks 24, 27, are merely key bricks to maintain the crucible 14 in its central position and that at both sides of these key bricks and the crucible there is an almost semi-circular fuel space down which the fuel can pass from the annular space 31 to the space 13. The feed heater cylinder 30 is held in place by the key bricks 32, at the sides of which the annular space 13 opens up into two arc shaped fuel holes which are closed by the two arc shaped lids 34, 35, which can be opened so as to open for the insertion of fuel into the annular space 31 and so on down to the fuel space 13 as aforesaid. The two lids 34, 35, are each made with an outstanding back arm 36 which at 37 is jointed to the end of the cross bar 38, adapted to be lifted by a lever 39 fixed to a short rock shaft 40 on the other end of which is a hand lever 41 so that by depressing this hand lever 41 the cross bar

38 and the parts 36 together with the lids 34, 35, will be lifted slightly so that one or both of them can then be turned about the joint 37 shown by the dotted line Fig. 5 to admit of the insertion of the fuel as aforesaid. 42 is a hinged lid for closing the top of the feed heater 30 and which can be opened for inserting the metal therein. The said feed tube shell 28 is made with a tubular back arm 43 lined with fire-brick at 44 and made with a top outlet 45 at its back end so as to form a flue for the furnace communicating with the annular space 13. This arm 43 is carried by side pins forming trunnions adapted to turn in bearings 47 fixed on a bracket 48 bolted to the wall so that the whole of the casing 28 with the feed heater 30 and other parts carried thereby can be turned up as shown by the dotted lines in Fig. 1, out of the way to permit of the furnace proper A being removed and tilted for pouring. The back top outlet 45 may be arranged to match the bottom inlet of a stationary flue or chimney 46 against which the said back top outlet fits when the feed tube 30 is in its normal horizontal position as shown by the full lines in Fig. 1 and as in Figs. 2 and 4. In order to increase the draft the said flue or chimney 46 may be fitted with a steam supply pipe and nozzle 50 to deliver a jet of steam up the chimney 46 so that thus the furnace can be worked either with a forced draft through the blast pipe 9, or with a natural draft without the blast pipe and with the chimney 46, or with an induced draft caused by the steam jet through the nozzle 50.

The feed heater 30 and the casing 28 and other parts on that side of the trunnions 47 not counter-balanced by the back part of the flue 43 can be counter-balanced by any convenient means as by the counter-balance weight 51 which through the chain 52 passing over the overhead pulley 53 is connected at 54 to the casing 28, the weight 51 being such as to maintain the said parts turned up about the trunnions 47 as shown by the dotted lines in Fig. 1. By employing the feed heater 30 with its casing 28 and parts arranged as above described it will be seen that no fumes or gas as from the coke can possibly touch the metal in the crucible 14. The said tubular arm 43 through which the heat passes from the furnace proper A to the chimney 46 may if desired be made with a removable lid such as 55 and adapted to hold one or more intermediate pots or ladles to hold the same ready for pouring the melted metal into them from the crucible 14 and thus save the necessity of using a separate furnace for heating these intermediate pots or ladles.

56 is a lid hinged at 57 to the top of the casing 1 and furnished with an operating hand lever 58 by which the lid 56 can (when

the portable part A is removed from underneath the casing 28) be turned up over the top of the crucible so as to cover the same. This cover is shown partly turned up in this way in Fig. 3.

The front of the casing 28 is fitted with a plumbago block 59 in which there is an inclined spy hole 60 directed toward the spout and in to the crucible to enable anyone to see how the metal is melting in the crucible and this spy hole 60 is adapted to be closed by a suitable door 61.

The accompanying drawings illustrate what I consider to be the best way of carrying my invention into practice but it is to be understood that my invention is not limited to the precise details shown as these may be varied to some extent without departing from the nature of my invention.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In a crucible furnace, an outer shell having an annular blast chamber, a plurality of twyers passing tangentially through said shell, and having communication with said blast passage, and cocks located in the outer ends of said twyers regulating the blast therethrough, said cocks being provided with means for rotating them, substantially as described.

2. In a crucible furnace, an outer shell having an annular blast chamber, a plurality of twyers passing tangentially through said shell and having communication with said blast chamber, and hollow cocks located in the outer ends of said twyers for regulating the blast therethrough, said cocks being provided with means for rotating them, the outer ends of said hollow cocks being provided with a transparent closure, whereby the cocks will serve as sight holes.

3. In combination a portable crucible furnace, a feed heater resting upon and disconnected from the upper end of said furnace, a chimney at one side of said furnace having an open lower end, said feed heater having a horizontal portion extending beneath the lower end of the chimney and normally bearing against the under side thereof, horizontal trunnions for said horizontally extending portion, and means for swinging said feed heater upon said trunnions, substantially as described.

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

MATTHEW HARVEY.

Witnesses:

CHARLES BOSWORTH KETLEY,  
WALTER BARTLAM.