July 19, 1927. 1,636,041

H. O. BREAKER

ELECTRIC FURNACE

Filed Feb. 9, 1923 2 Sheets-Sheet 1

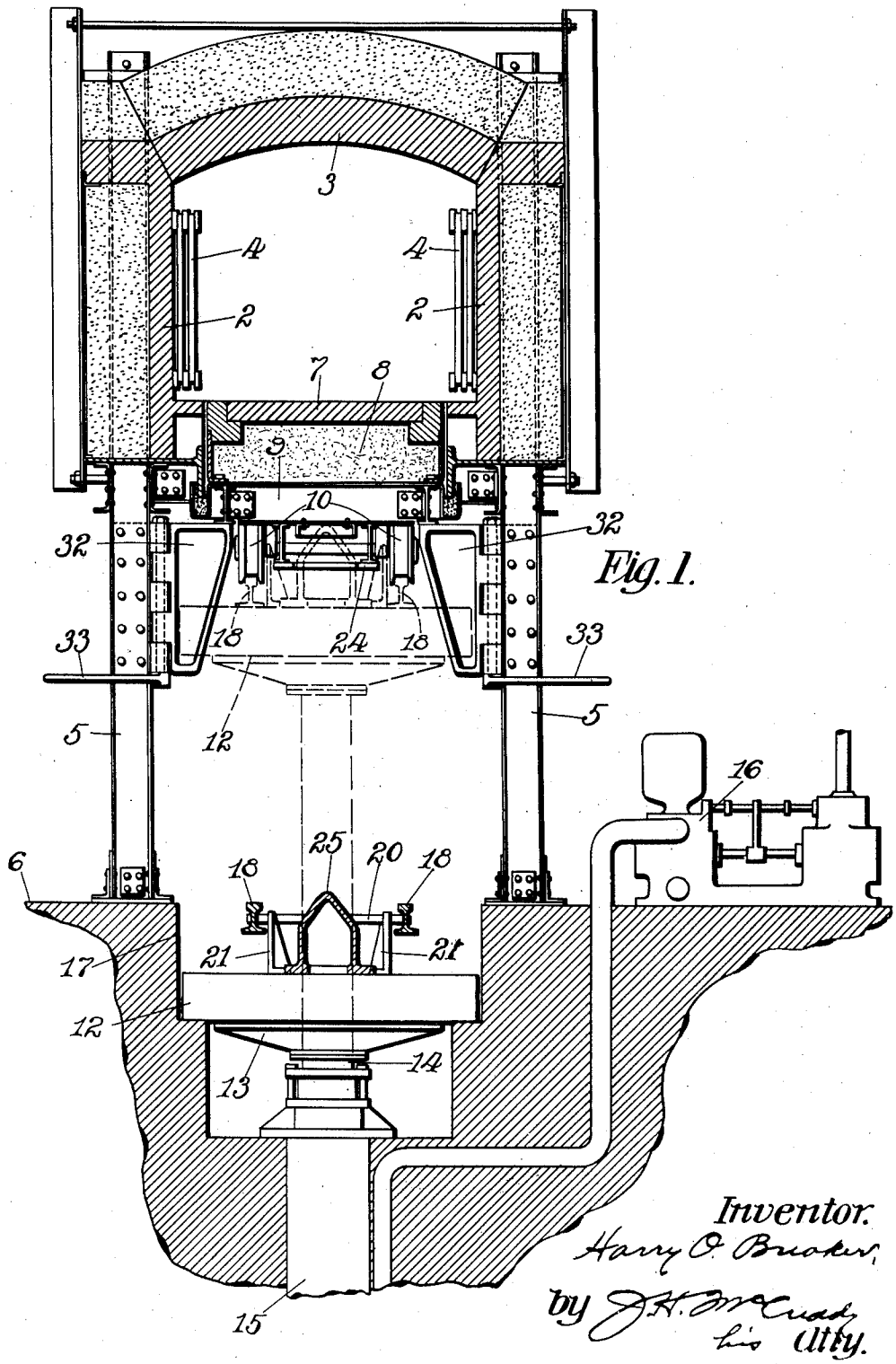



Fig. 1.

Inventor.
Harry O. Breaker,
by J. H. McCaskey
his Atty.

July 19, 1927. 1,636,041

H. O. BREAKER

ELECTRIC FURNACE

Filed Feb. 9, 1923 2 Sheets-Sheet 2

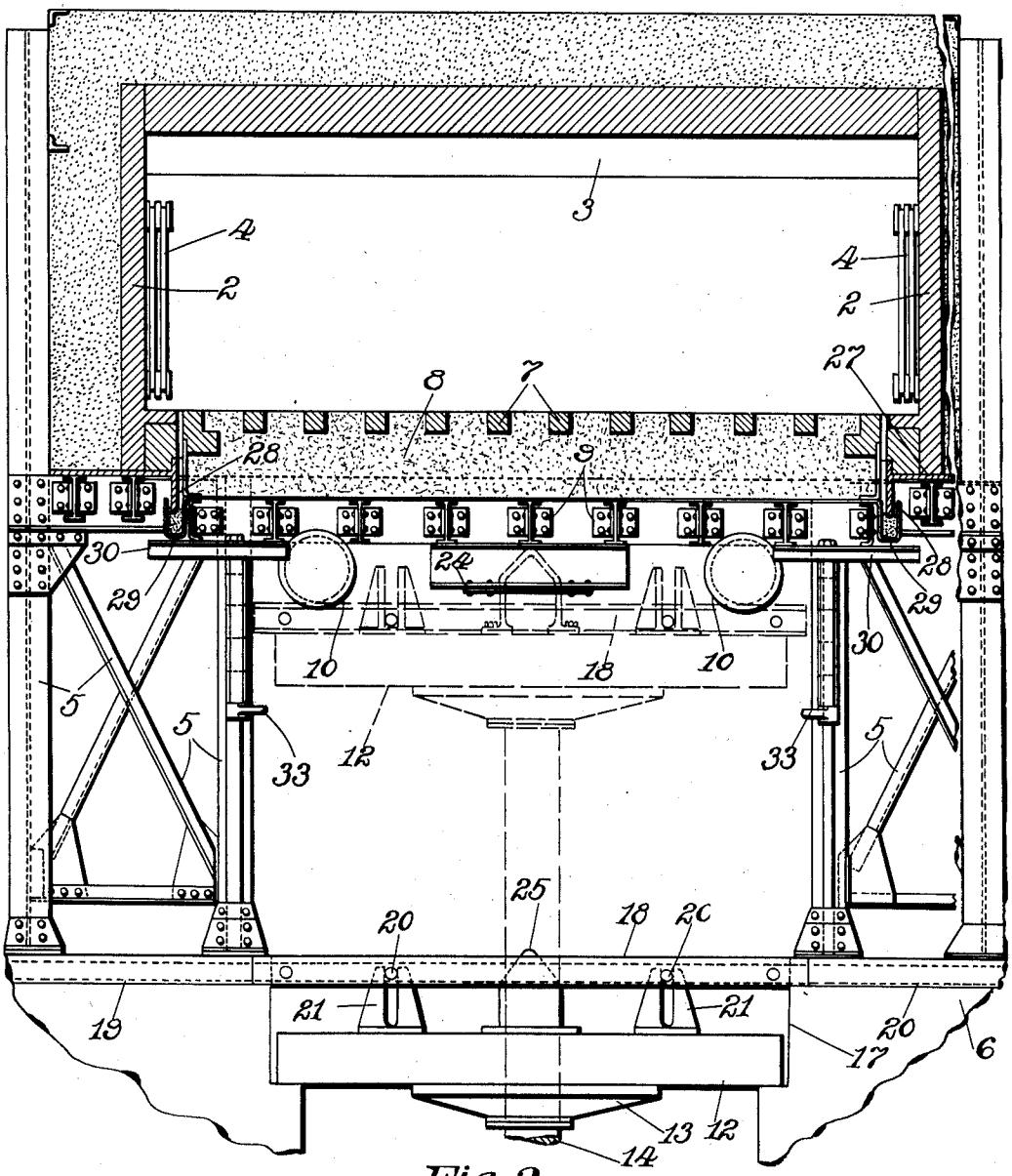



Fig. 2.

Inventor.
Harry O. Breaker,
by J. H. McCurdy
his Atty.

Patented July 19, 1927. 1,636,041

# UNITED STATES PATENT OFFICE.

HARRY O. BREAKER, OF WINTHROP, MASSACHUSETTS.

## ELECTRIC FURNACE.

Application filed February 9, 1923. Serial No. 618,149.

This invention relates to electric furnaces and is especially concerned with electric furnaces of the larger types designed for the treatment of relatively large quantities of material at one time.

As is well understood by those familiar with apparatus of this character, it is usual to construct one side of an electric furnace with a door or opening through which the load or charge may be introduced into the furnace and subsequently withdrawn again. While the furnace is in operation this opening is closed as tightly as possible, but it is never possible to heat insulate the side of the furnace containing this opening as thoroughly as are the other walls of the furnace. The result is that there is always a "cold zone" adjacent to the door, and the fact that this region of lower temperature is present must be borne in mind in arranging the charge within the furnace.

A further objection to furnaces constructed as above described is that the heat pours out of such a furnace the instant the door is opened, with the result that all the walls of the furnace lose a great deal of their heat while the unloading and loading operations are being performed. This heat loss must be made up after the new charge has been placed in the furnace and it has been closed again.

With these considerations in view, it is an important object of this invention to devise a furnace construction in which the "cold zone" above described will be eliminated, and in which the heat losses from the causes just mentioned will be greatly reduced. The invention further aims to improve the construction of electric furnaces with a view to facilitating the loading and unloading operations, reducing the floor space occupied, and providing for the more convenient handling of materials in the neighborhood of the furnace.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

In the drawings,

Figure 1 is a vertical, transverse, cross sectional view of an electric furnace constructed in accordance with this invention, some of the parts being indicated diagrammatically; and

Fig. 2 is a vertical, longitudinal, cross sectional view of the furnace shown in Fig. 1.

The construction shown comprises an electric furnace having side walls 2 and a top 3, these parts being made of any suitable material and supported in a structural steel shell in the usual manner. It will be understood that these parts usually comprise a lining of vitreous brick, or other fire resistant material, backed by suitable heat insulating materials. In constructing this portion of the furnace the standard practice may be followed except that no openings are made other than those that may be required for observation purposes. Metallic resistors, indicated at 4, are secured to the side walls 2 and are connected with suitable sources of current to supply the necessary degree of heat to the furnace. The furnace is supported in an elevated position by means of structural steel members, indicated in general at 5, which rest on a suitable floor 6.

The hearth 7 of the furnace is mounted on, or forms part of, a bottom 8 which, in the present instance, is supported on a car, the frame or body of which is shown at 9, the wheels being indicated at 10. For the purpose of raising the bottom 8 of the furnace and the hearth 7 into their operative positions, as shown in the drawings, and lowering them out of said positions again to facilitate loading and unloading, these parts are mounted on the platform 12 of an elevator. Preferably the elevator is of the hydraulic type, including a plunger cap 13 and piston 14. The piston works in a cylinder 15 to which water or other fluid under pressure is supplied, as desired, by the pump 16, Fig. 1. A pit 17 is formed in the floor 6 to receive the platform 12.

In the arrangement shown the wheels of the car 9 are supported on rails 18—18 which, when the platform is in its lowered position, cooperate with rails 19 and 20 on the floor 6 to form a continuous track. The ends of the rails 18—18 at this time rest on shoulders formed in the walls of the pit 17, as indicated in Fig. 2. In order to hold the rails in the desired position on the platform, they are connected by two transverse bars 20—20 located in slots formed in brackets 21—21 which are bolted to the platform.

It will thus be evident that when the platform 12 is lowered into the position shown in full lines in Figs. 1 and 2, the car 9 may be run off the platform in either direction

on to the track supported on the floor 6. Another car equipped with a bottom and hearth like those indicated at 7 and 8, can then be run on to the platform and raised into their operative position.

It is important that the car be accurately located on the platform of the elevator and for this purpose each car has a plate 24 secured to the bottom thereof, and a hole is punched through this plate to receive an upright, tapered pin or plug 25 which is secured fast on the platform 12. It will be noted that when the platform is in its lowermost position, as shown in Fig. 2, this pin or plug is below the level of the plate 24. As the platform rises, the pointed end of the pin will enter the hole in the plate 24, and if the car is only slightly out of its proper position, the pin will move the car into its centered position on the platform due to the action of the tapered sides of the pins on the walls of the hole in the plate 24. Thereafter, the pin will securely hold or lock the car in its centered position on the elevator.

The furnace proper has a bottom plate 27 which is provided with a depending flange 28 that surrounds the opening in the furnace. As the furnace bottom 8 is moved into its cooperative relationship to the other parts of the furnace, this flange 28 is entered in a trough 29 which is secured to and surrounds the margin or outer edge of the bottom 8. This trough contains sand or some other sealing material into which the edge of the plate 28 is forced; so that as the furnace bottom is moved into its operative position, the space between the bottom 8 and the side walls 2 is automatically sealed. The furnace thus forms an enclosure adapted to confine an atmosphere or body of gas and to substantially prevent interchange of this atmosphere.

The elevator preferably is provided with the usual devices for preventing an overtravel so that the range of upward movement of the elevator will be limited. Two bumpers 30—30 are secured rigidly to the opposite ends of the car body where they protect the sand trough 29 in case one car bumps into another.

Under some conditions the bottom and hearth may be mounted directly on the elevator platform. Usually, however, it is preferable to have these parts supported on or form part of a car, as will readily be appreciated by those versed in this art. Where this is the case it is often desirable to be able to lock a car in its elevated position and then to lower the platform so that the track will be completed and cars may be moved back and forth under the furnace. This object is conveniently accomplished in the structure shown by providing four stops 32, the construction of which is best shown in Fig. 1. Each stop consists of a relatively heavy bracket, mounted on a vertical pivot which is supported by one of the structural frame members 5. Each stop also is provided with a handle 33 by means of which it may be swung into and out of its operative position. These stops, when swung under the body of the car, will support the car in its uppermost position with the bottom 8 and hearth 7 in their cooperative relationship to the other parts of the furnace. The elevator platform may then be dropped into its lowermost position, where it will facilitate the movement of materials in the plant in which the furnace is installed, due partly to the fact that the track then will be complete, and also because the parts of the elevator will be out of the way. When it is desired to unload the furnace again, the elevator platform will be raised into position to support the car 9 and its load, the stops 32 will be swung into their inoperative positions, and the platform, with its load, may then be lowered.

In those cases in which the car is equipped with smooth faced wheels, as distinguished from flanged wheels, the rails and tracks will be eliminated, and the elevator when in its lowermost position will be stopped so that its upper surface is flush with the surface of the floor.

It will now be appreciated that since the side walls and top of the furnace are never opened but remain fixed and immovable, the unloading being effected by simply dropping the bottom out of the furnace, any circulation of air within the furnace, even when it is open, is practically eliminated. In the ordinary furnace the opening of the door for the purpose of unloading the furnace, or for any other reason, allows a free circulation of air through the furnace, which results in a very substantial heat loss. In the present construction, however, the hot air is pocketed in the furnace and while some interchange of air may be produced when the bottom of the furnace is lowered, this interchange is insignificant, practically the same atmosphere being retained in the furnace during the treatment of successive charges. This construction, therefore, produces a very substantial increase in thermal efficiency since practically the same atmosphere is retained in the furnace during the treatment of successive charges. The efficiency of the furnace is further increased by the fact that the "cold zone" created by the presence of side doors and the like, as above explained, is totally eliminated. The furnace shown is especially adapted for the heat treating of metal parts or pieces, and the ease and convenience with which the furnace may be loaded and unloaded, and the facility with which materials may be moved under and around the furnace, is therefore a great practical advantage.

The pocketing of the heated atmosphere in the furnace enclosure, as above described, is a very important advantage not only from the standpoint of improving the thermal efficiency of the furnace, but also because it retains substantially the same atmosphere within the furnace for practically an indefinite period. The oxygen in this atmosphere becomes burned out in a very short period of use, and thereafter the atmosphere or gas which comes in contact with the heated metal parts is inert, or at least non-oxidizing, so that scaling of the metal pieces is prevented. This advantage of the present construction is particularly valuable, also, when it is desired to treat the metal parts in a reducing gas or in an atmosphere of some special composition, as is a common practice.

While I have herein shown and described the best embodiment of my invention which I have so far devised, it will be appreciated that the invention is not limited to embodiment in the exact form shown, but that it may be embodied in many forms without departing from the spirit or scope thereof.

Having thus described my invention, what I desire to claim as new is:

1. An apparatus of the character described, comprising, in combination, parts arranged to form an enclosure adapted to confine a body of gas, said enclosure including a furnace having walls supported in a fixed position and a bottom movable to open or close the furnace, electric resistors mounted in said furnace for heating the furnace, and an elevator arranged to raise said bottom into cooperative relationship to said walls and to lower said bottom out of such relationship.

2. An apparatus of the character described, comprising, in combination, parts arranged to form an enclosure adapted to confine a body of gas, said enclosure including a furnace having walls supported in a fixed position and a bottom movable to open or close the furnace, electric resistors mounted in said furnace for heating the furnace, an elevator arranged to raise said bottom into cooperative relationship to said walls and to lower said bottom out of such relationship, and means for holding said bottom in its operative position when desired while the elevator is lowered.

3. An apparatus of the character described, comprising, in combination, parts arranged to form an enclosure adapted to confine a body of gas, said enclosure including a furnace having walls supported in a fixed position and a bottom movable to open or close the furnace, electric resistors mounted in said furnace for heating the furnace, an elevator having a plunger on which said bottom is supported, said elevator being operative to raise said bottom into cooperative relationship to said walls and to lower said bottom into position to discharge or receive its load, and means for sealing the space between said bottom and said walls when the bottom is in its operative position.

4. An apparatus of the character described, comprising, in combination, an electric furnace including fixed top and side walls and a removable bottom, an elevator for raising said bottom into its cooperative relationship to said walls and to lower said bottom into position to discharge or receive its load, a marginal flange projecting downwardly from the lower side of the furnace and surrounding the opening therein normally closed by said bottom, a trough surrounding said bottom and adapted to receive said flange when the bottom is moved into its operative position, and sealing means within said trough.

5. An apparatus of the character described, comprising, in combination, an electric furnace having a top and side walls, a removable bottom for said furnace, a car for supporting said bottom, an elevator for raising and lowering said car to carry said bottom into and out of cooperative relationship to the other parts of the furnace, said elevator including a platform for supporting the car, and cooperating devices on said car and platform for centering the car on the platform.

6. An apparatus of the character described, comprising, in combination, an electric furnace having a top and side walls, a bottom for said furnace including a hearth, a car supporting said bottom and hearth, an elevator for raising and lowering said car to carry said bottom and hearth into and out of cooperative relationship to the other parts of the furnace, and cooperating devices on said car and elevator for locking said car in a definite position on said elevator.

7. An apparatus of the character described, comprising, in combination, an electric furnace having a top and side walls, a bottom for said furnace including a hearth, a car supporting said bottom and hearth, an elevator for raising and lowering said car to carry said bottom and hearth into and out of cooperative relationship to the other parts of the furnace, and means independent of said elevator for holding said car in an elevated position where it will support said bottom and hearth in their operative positions.

8. An apparatus of the character described, comprising, in combination, an electric furnace including fixed top and side walls and a removable bottom, an elevator having a plunger on which said bottom is supported, said elevator being operative to raise said bottom into cooperative relationship to said walls and to lower said bottom into position to discharge or receive its load, means for holding said bottom in its opera-

tive position when desired while the elevator is lowered, and means for sealing the space between said bottom and said walls when the bottom is in its operative position.

9. An apparatus of the character described, comprising the combination of an electric furnace having a top and side walls, a bottom for said furnace movable into and out of cooperative relationship to said walls, a hearth mounted on said bottom, a car supporting said bottom and hearth, an elevator for raising and lowering said car to carry said bottom and hearth into and out of their operative positions, means supporting said furnace in an elevated position, a floor under said furnace, said floor having a pit therein to receive the platform of said elevator, rails on said platform to support said car, and additional rails on said floor cooperating with the rails on said platform to form a continuous track when the platform is in its lowered position, and cooperating devices on said car and platform for centering the car on the platform and locking it in a definite position thereon.

10. An apparatus of the character described, comprising the combination of an electric furnace having a top and side walls, a bottom for said furnace movable into and out of cooperative relationship to said walls, a hearth mounted on said bottom, an elevator for raising and lowering said bottom and hearth into and out of their operative positions, a marginal flange projecting downwardly from said furnace and surrounding the opening normally closed by said bottom, a marginal trough carried by said bottom and arranged to receive said flange when the bottom is moved into its operative position, and sealing means within said trough.

11. An apparatus of the character described comprising, in combination, a heat treating furnace, means for supporting said furnace in an elevated position, electric resistors in said furnace for heating the furnace, said furnace including a removable bottom with a hearth supported thereon, a car supporting said bottom, and an elevator for raising and lowering said car to carry said bottom into and out of cooperative relationship to the other parts of the furnace.

HARRY O. BREAKER.