

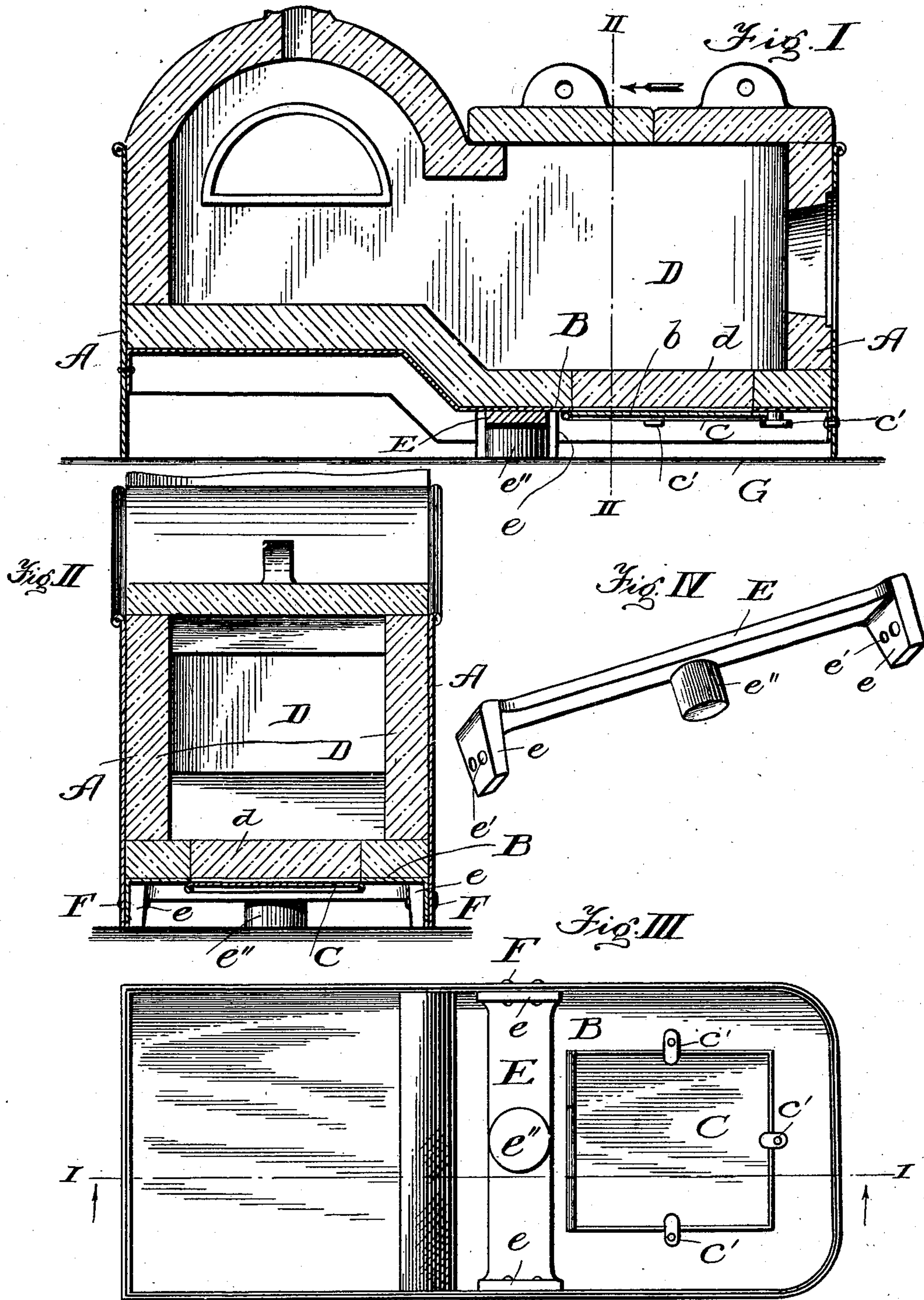
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A. C. CALKINS.  
ASSAYER'S FURNACE.

(Application filed Feb. 17, 1899.)

(No Model.)



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# UNITED STATES PATENT OFFICE.

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## ASSAYER'S FURNACE.

SPECIFICATION forming part of Letters Patent No. 711,554, dated October 21, 1902.

Application filed February 17, 1899. Serial No. 705,870. (No model.)

*To all whom it may concern:*

Be it known that I, ALBERT C. CALKINS, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Assayers' Furnaces, of which the following is a specification.

My invention relates to furnaces used by assayers in the reduction of pulp of mineral-bearing rocks for the purpose of extracting therefrom the metals which they contain, such furnaces being adapted to use a hydrocarbon fuel. Such furnaces comprise an external sheet-metal case having parallel sides with fire-brick lining, and it is customary in such furnaces to provide in the bottom of the sheet-metal case a door. This door is arranged to allow of the ready removal of a temporary floor thereabove, which consists of a mixture of fire-clay and other materials, which can be easily removed from the floor of the chamber when it becomes necessary to replace the floor on account of the fluxes or slag having accumulated thereon to such an extent as to interfere with the working of the furnace or when through accident one of the crucibles should have become broken and the valuable contents thereof spilled upon the floor of the furnace. Heretofore such doors have been made to slide into place and be held by suitable latches in order to provide with ordinary sheet-metal construction a sufficient strength to hold the fire-brick and composition bottom which rests upon the door. The sheet-iron bottom of the jacket which supports the furnace-lining is raised above the bottom edge of the jacket for a considerable distance—about one and one-half to two inches—for the purpose of providing an air-space between the bottom of the furnace and the table upon which the furnace rests, as the heat from the furnace proper would be liable to become so great as to endanger the table or woodwork upon which it rests. This raising of the sheet-iron bottom above the lower edges of the jacket-case also allows room for the door and latches. The depending edges of the jacket below the sheet-iron bottom has hereto-

fore been unsupported, and when it becomes necessary for any purpose to cant the furnace upon one side or to turn it around upon the table upon which it rests the edges of the jacket have become dented or bent, so that the furnace does not rest securely upon its base. With the former constructions the furnace-floor, which is made of sheet-iron, and the walls are liable to sag and throw the body of the furnace out of shape when the heat of the furnace is sufficient to reduce the charges in the crucibles contained therein.

The objects of my invention are to improve the furnace so as to do away with these difficulties and to strengthen the sheet-iron floor and side walls and allow the use of a door hinged to the bottom instead of a slide-door, adapted for the ready removal of the fire-clay-mixture bottom of the furnace when such floor either becomes fouled or has metal spilled upon it.

A further object of my invention is to provide a floor which will be strong enough to support the refractory bottom of an assay-furnace and to avoid any warping or cracking, which would be liable to throw the refractory bottom or side walls of the furnace out of place. To accomplish this end, it is necessary to provide a floor of light material which will not exert sufficient force when expanding to displace the refractory sides or bottom and which will not crack when contracting after the fire has been extinguished.

By the use of my invention I am enabled to overcome any bulging of the walls of the furnace and at the same time to thoroughly support the bottom of the furnace by the use of a light sheet-iron bottom, the expansion and contraction of which does not affect the refractory walls or bottom, the strength of which as ordinarily constructed being sufficiently great to resist all such force. This is not possible where a heavy metal bottom is used.

A cast-metal bottom is liable to either crack or warp on account of the heating and cooling of the furnace, and it would not be possible to hinge a door upon such a bottom and



have it close closely after the furnace had been in use for any considerable time.

By my invention the furnace is strengthened by the addition of very little weight, which is a very important feature in cases where the furnace is to be transported long distances through desert country by means of freight-teams or where it has to be packed upon the backs of animals.

The accompanying drawings illustrate my invention.

Figure I is a vertical longitudinal section of a combined furnace and muffle provided with my invention and mounted on a table, said section being taken on line I I of Fig. III looking in the direction of the arrow. Fig. II is a vertical cross-section of the same, cutting through the door on line II II, Fig. I. Fig. III is a plan of the bottom of the furnace. Fig. IV is a detail of my newly-invented assayer's furnace strengthening-bar.

A indicates the sheet-metal walls or jacket of the furnace; B, the sheet-metal floor, with opening *b* therethrough.

C indicates a door hinged to the under side of the floor to close the opening.

D indicates fire-brick inside the sheet-metal jacket formed by the walls A and the floor B.

*d* indicates the removable fire-clay mixture, which rests upon the trap-door C.

*e'* indicates buttons by which the trap-door is held up in place.

E indicates my newly-invented strengthening-bar, which is equal in length to the space between the downward extensions of the side walls of the furnace below the floor thereof and provided at each end with a downwardly-extending leg *e*, provided with holes *e'* therethrough, said bar also being provided at its mid-length with a downwardly-projecting boss or leg *e''*, the bottom of which is in the same plane with the bottoms of the side legs.

The depth from the top of the bar to the bottom of the legs is equal to the space between the under side of the floor and the bottom of the downward extension of the side walls of the furnace-jacket, so that when the furnace is set upon a table or other support G with a plain surface the three legs *e e e''* of the bar will rest upon the surface and form a support for the middle of the furnace-floor.

F indicates rivets inserted through the downward extension of the side walls of the furnace and also inserted through the side legs, respectively, and riveted to hold the downward extensions of the side walls against the leg *e*.

By the use of my improved strengthening-bar it will be seen that the side walls of the jacket, which extend below the floor of the furnace, (thereby providing the air-space between the floor of the furnace and the table upon which the furnace rests,) are strengthened, and by providing the central leg upon

the bar the center of the furnace is also supported.

It becomes necessary to provide this central support, because the heat within the furnace-body is of such a degree that when the furnace-body becomes thoroughly heated it is liable to settle in the center.

Now, having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An assayer's furnace comprising the sheet-metal floor B with openings *b* therethrough; the sheet-metal walls or jacket extending below the floor; a door hinged to the under side of the floor to close the opening *b*; fire-brick inside the sheet-metal jacket formed by the walls and the floor; a removable fire-clay mixture which rests upon the trap-door; means by which the trap-door is held up in place; and a strengthening-bar which is equal in length to the width between the downward extensions of the side walls of the furnace below the floor thereof and provided at each end with a downwardly-extending leg *e* provided with holes *e'* therethrough; said bar also being provided at its mid-length with a downwardly-projecting boss or leg *e''*, the bottom of which is in the same plane with the bottoms of the side legs; the depth from the top of the bar to the bottom of the legs being equal to the space between the under side of the floor and the bottom of the downward extension of the side walls of the furnace-jacket; and rivets inserted through the downward extension of the side walls of the furnace, and also inserted through the side legs respectively and riveted to hold the downward extension of the side walls against the leg *e*, said bar being located near the mid-length of the floor, substantially as set forth.

2. The combination, with a furnace, the side walls of which extend below the bottom, of a strengthening-bar arranged transversely across the bottom of the furnace, said bar being provided with a depending leg at each end and an intermediate leg, the lower ends of said legs terminating in the same plane and the end legs being perforated and rigidly secured to the side walls with their lower ends flush with the lower edge of the walls, the upper face of the bar resting against the bottom of the furnace.

3. The combination, with a furnace, the bottom of which is provided with a door and the side walls extend below the bottom, of a strengthening-bar arranged transversely across the bottom to the rear of said door, the top of the bar being flat and resting against the bottom of the furnace and the under side being provided with a leg at each end and a leg at the center, said center leg being circular in cross-section, and the end legs being rigidly secured to the extended portion of the side walls.



4. An assayer's oven comprising a thin metallic shell, the bottom of which is at a distance above the lower edge of the side walls, and is provided with an opening, a door for  
5 said opening, said door being hinged at its rear edge to the rear wall of the opening, catches secured to the other walls of the opening adapted to engage with the free edges of the door, and hold it against the bottom, and a removable lining within the shell, a portion 10 of which is of the same area as the opening in the bottom and rests upon the door.

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