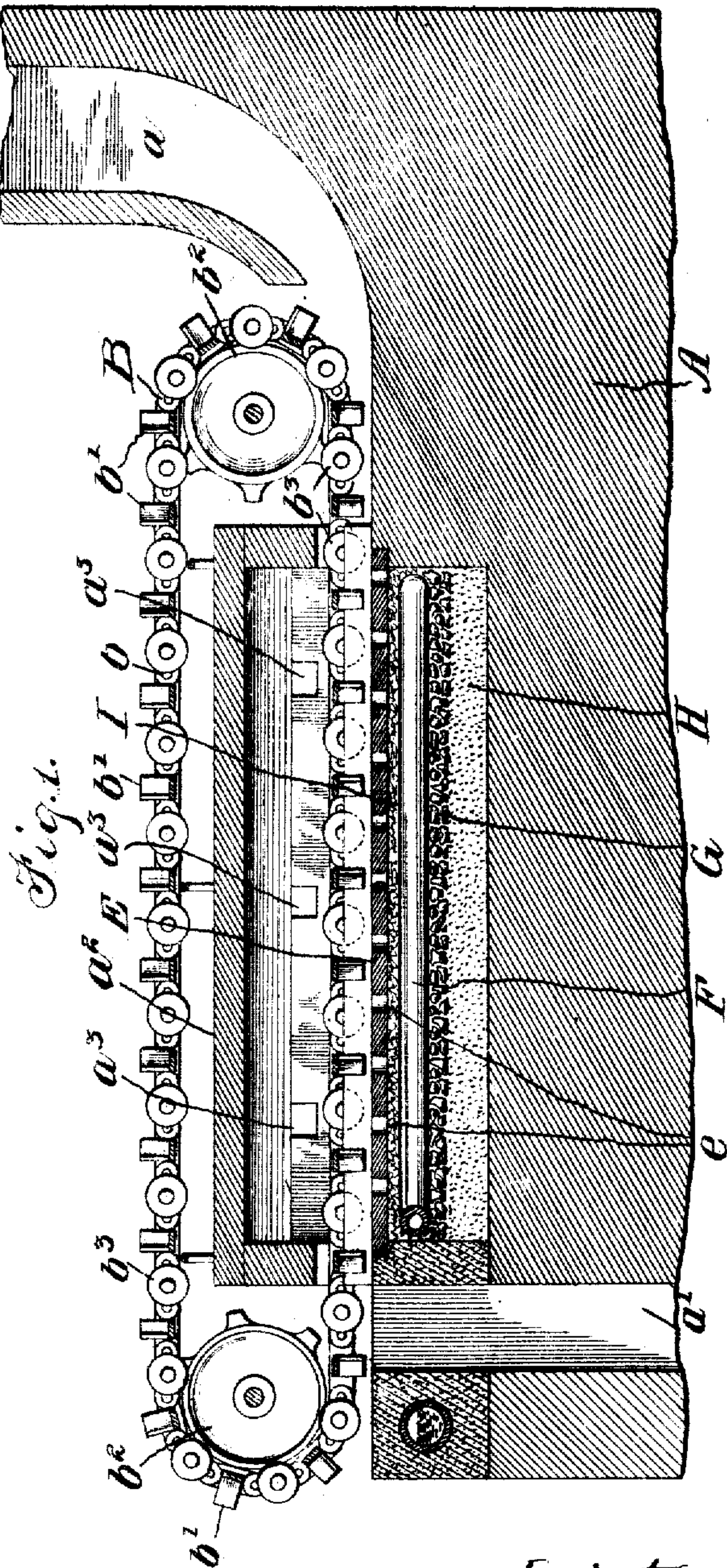


APPLICATION FILED FEB. 21, 1903. RENEWED AUG. 6, 1909.

Patented Mar. 22, 1910.



Inventor,
Charlie E. Mark
By Buckley Durand
Attys.

C. E. MARK.

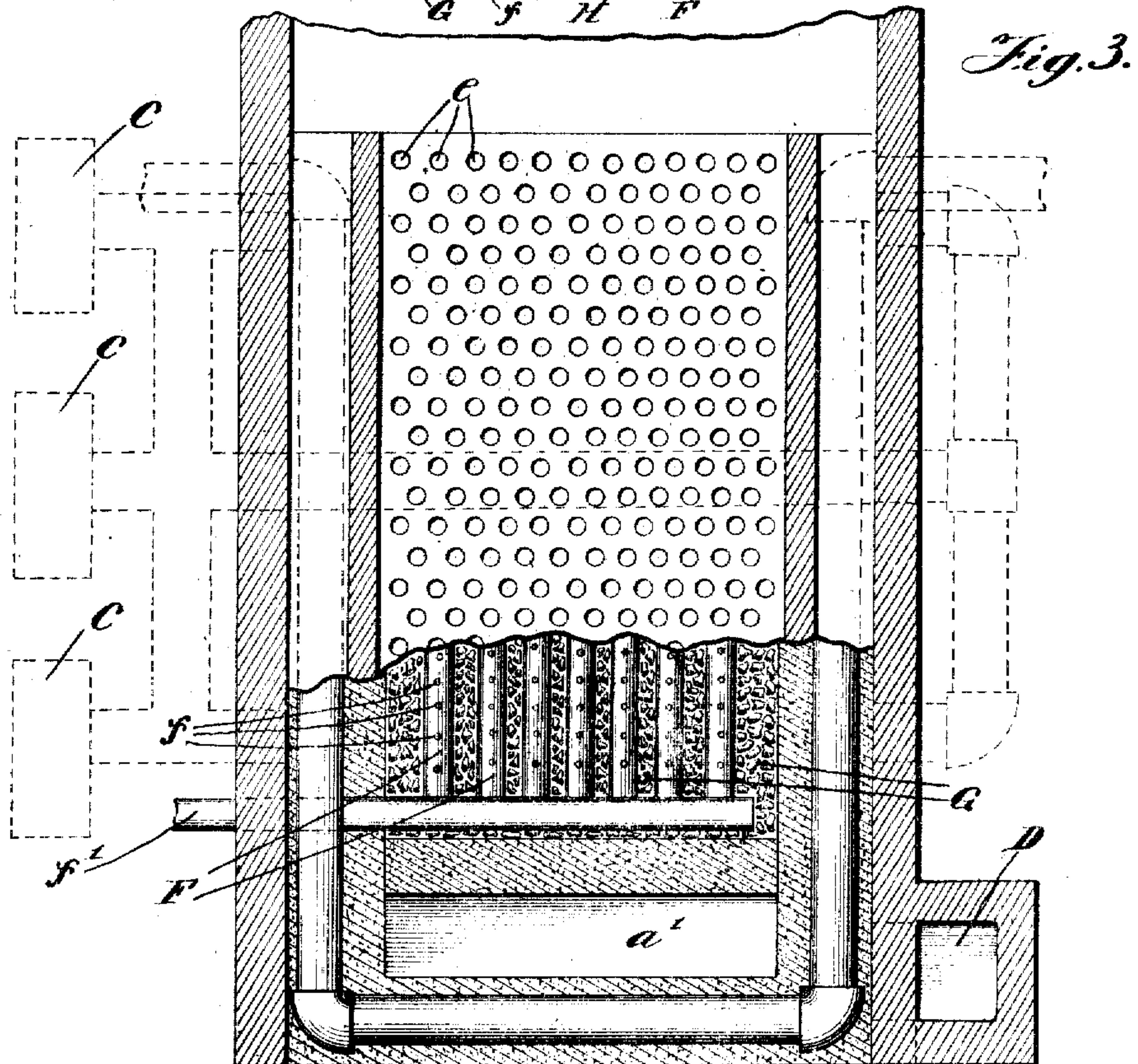
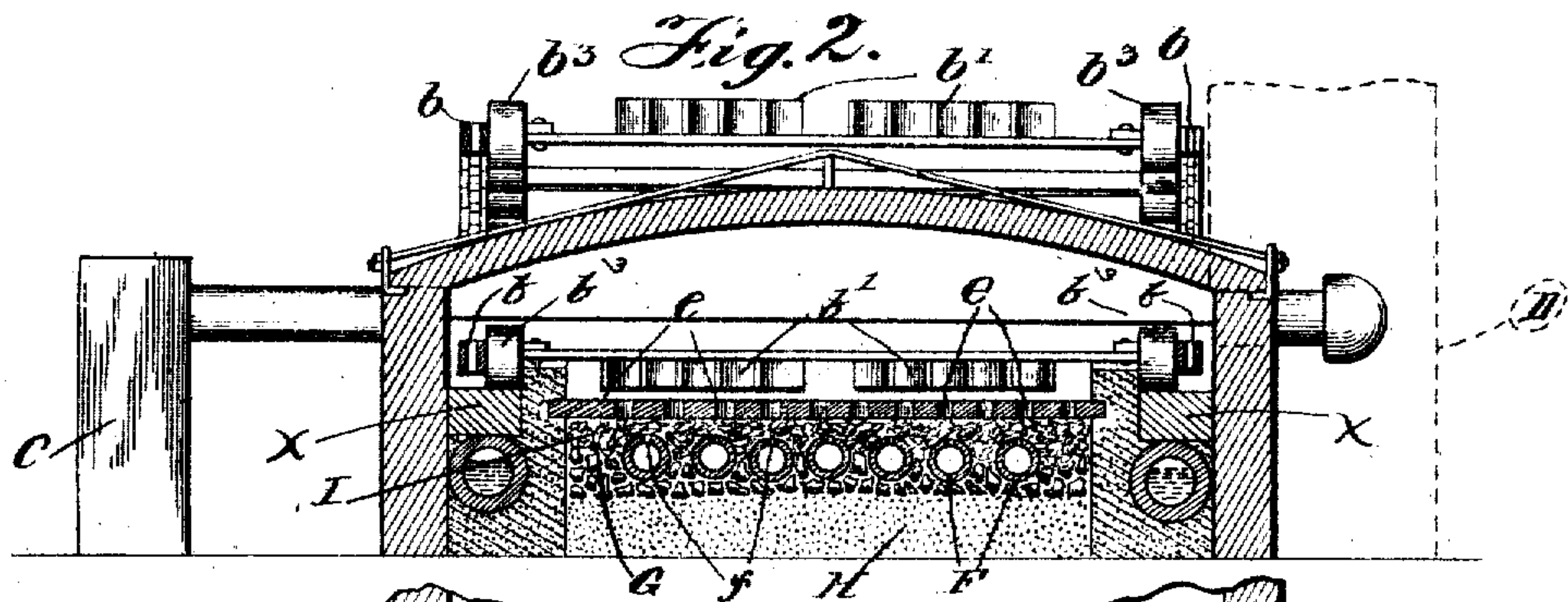
ORE ROASTING FURNACE.

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2 SHEETS—SHEET 2.



Witnesses:
Ira L. Perry
W. B. Weir

Inventor:
Charles E. Mark
By *Buttleggs & Durand*
attys

UNITED STATES PATENT OFFICE.

CHARLIE E. MARK, OF CHICAGO, ILLINOIS

ORE-ROASTING FURNACE.

952,680.

Specification of Letters Patent.

Patented Mar. 22, 1910.

Application filed February 21, 1903, Serial No. 144,430. Renewed August 6, 1909. Serial No. 511,648.

To all whom it may concern:

Be it known that I, CHARLIE E. MARK, a citizen of the United States of America, and resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Ore-Roasting Furnaces, of which the following is a specification.

My invention contemplates an ore roasting furnace having a perforated or apertured hearth of any suitable material. For example, the said hearth may be composed of fire-brick, fire-clay, or other like refractory materials, or it may be composed of sand pressed into the proper form by hydraulic or other pressure, in a manner similar to ordinary sand brick. As stated, however, the hearth may be of any suitable material, and can be constructed of any substance adapted to be formed with perforations or apertures of definite size and location, and capable of resisting disintegration during the roasting of the ores. And in connection with a hearth of this character, my invention also contemplates suitable means for forcing air or other gas upwardly through the perforations or apertures of the hearth, so as to produce the desired oxidizing or other action on the ore resting on the hearth. The nature and advantages of my invention will, however, hereinafter more fully appear.

In the accompanying drawings:—Figure 1 is a longitudinal section of the hearth portion of a roasting furnace having a hearth characterized by my invention. Fig. 2 is a cross-section on a smaller scale of a roasting furnace provided with my improved hearth. Fig. 3 is a plan of my improved hearth, a portion of the hearth being broken away to show the air pipes. Fig. 4 is an enlarged cross-section of a portion of my improved hearth, showing the manner in which the apertures or pockets of the hearth may become filled with granular material, such as pulverized ore, sand, or other like material, without destroying its efficiency, and without impeding the passage of the air upwardly through the hearth.

As thus illustrated, the construction of the roasting furnace may be of any suitable, known, or approved character. For example, it may comprise the usual masonry A, having an inlet a for the pulverized ore, and having an outlet a' through which the ore is discharged after it has been roasted. The

ordinary mechanical rabblers B can be employed for stirring the pulverized ore on the hearth, and for causing the same to slowly progress from the inlet end of the hearth to the discharge, at which latter part the roasted ore then descends through the discharge opening a' . These rabblers are, it will be observed, in the form of link-belts b provided with angularly arranged buckets or projections b' adapted to slide forward over the hearth. The lower leaf of the belt-like structure composed of the sprocket-chains and projections is, of course, arranged to lie close to the surface of the hearth, and the upper leaf of the belt can travel outside of the roof or top wall a'' of the furnace. Sprocket-wheels b^2 support the link-belts at each end of the furnace.

The heat can be supplied by gas or petroleum burners C, shown in dotted lines in Fig. 3 and in full lines in Fig. 2. These burners can be pipe-connected with the lateral openings a^3 , extending through the side walls of the furnace, and with this arrangement the draft will be from the burners through the interior of the furnace and thence up through the stack D. My improved hearth E may consist of a single slab of fire-brick or fire-clay having the apertures or pockets e , which, it will be seen, are preferably of definite size and location. This hearth can, however, be composed of any other suitable material which will not disintegrate during the process of roasting the ore, and can be constructed of either one or several pieces. Below this furnace proper I arrange a number of pipes F, each provided with apertures f , and each connected at one end with a header or supply pipe f' . These pipes are preferably supported upon a layer of crushed rock or other like material G, which in turn rests preferably upon a layer of earth H. Above the pipes some fine material, such as sand, asbestos, or other finely porous material, I, can be arranged. Thus the hearth structure as a whole is preferably made up of an upper layer having apertures or pockets, a lower layer of earth or other like material, and intermediate layers of crushed rock, asbestos, sand, or other like material, the structure as a whole comprising a system of piping interposed between the layer of crushed rock and the layer of material which is below the perforated or apertured top layer.

Now with this construction, the pulverized gold sulfids or other ores, can be placed upon the hearth in the usual manner, and the heating apparatus and the rabbles can then be started, so as to simultaneously roast and agitate ore in the usual and wellknown manner.

As shown in the drawings, the general construction of the furnace is of the well-known type employed for roasting gold sulfids. For such purpose, the sulfids are usually crushed and finely pulverized, and this pulverized material is then spread upon the hearth, it being preferably fed through the chute or opening *a*, where it is then conveyed to and across the hearth by the rabbles. In such case, the pulverized ore will, of course, fill the apertures or pockets of the hearth, but this will in no way interfere with the upward passage of the air through the hearth, inasmuch as such pulverized material is finely porous—that is to say, of sufficient porosity to permit the passage of the air or gas. The pipes can be connected with a suitable source of air pressure, and the air passing upwardly through the hearth produces the desired oxidizing effect on the sulfids or upon the other ores or materials roasting on the hearth. With my improved arrangement, air is passed easily and evenly up through the hearth, and the efficiency of the hearth in this respect is in no wise decreased or interfered with by allowing the rabbles to drag on its upper surface.

The rabbles may, if such is desired, be provided with rolls *b*^s adapted to travel on the tracks or walls *X* arranged at each side of the hearth, so as to prevent the projections *b*^r from dragging on the hearth. However, as stated, this feature may be dispensed with in view of the fact that with my improved hearth construction the rabbles may drag on the upper surface of the hearth without in any way injuring it, and without in any way interfering with its function of feeding oxygen upwardly to the pulverized sulfids.

Thus it will be seen that I provide an improved roasting furnace adapted more particularly for use in roasting various ores, and adapted to more efficiently oxidize the same. And furthermore, it will be seen that with my improved hearth construction air for oxidizing the ore can be effectively passed upwardly through the hearth, the air being distributed evenly throughout the mass of ore, and the hearth structure as a whole being permeable to air but impermeable to the materials resting upon it. In the case of pulverized gold sulfids, or other granular material, the hearth proper, or perforated upper layer of the hearth structure, may then be said to be composed of a solid layer having pockets filled with porous

granular material. In other words, in such case the granular material in the pockets may be regarded as constituting a part of the hearth itself. And with the provision of this solid apertured upper layer, the hearth is not only of a character to permit the air to be supplied to the ore in this particular manner, but also of a character to permit its upper surface to be scraped and cleaned off whenever such is desired. As another advantage, it will be seen that my improved hearth construction is of a character to permit the rabbling to be done either mechanically or by hand.

I claim as my invention:—

1. A roasting furnace provided with a hearth structure having an upper layer of solid and rigidly united material provided with apertures, and means for passing air upwardly through said apertures, together with porous means adapted and applied for preventing the ore from falling through the said apertures.

2. An ore roasting furnace comprising a hearth structure composed of superimposed layers, the upper layer being rigid or immovable and provided with apertures of definite size and location, and means for passing air upwardly through said apertures, together with porous means adapted and applied for preventing the ore from falling through the said apertures.

3. An ore roasting furnace comprising a hearth provided with pockets, means for passing air upwardly through said pockets, mechanical rabbles arranged above said hearth, and porous means adapted and applied for preventing the ore from falling through said pockets, each pocket being circumscribed by rigidly or integrally united material.

4. An ore roasting furnace comprising a hearth structure having an upper layer of hard material provided with apertures, and air pipes for feeding air upwardly through said apertures, together with porous means adapted and applied for preventing the ore from falling through the said apertures.

5. An ore roasting furnace comprising a hearth composed of superimposed layers, the upper layer being of hard material and provided with apertures, the lower layer being of suitably porous material, and air pipes arranged in said porous material and adapted for supplying air through said apertures to the ore.

6. A roasting furnace comprising a hearth or bed having a smooth upper surface provided with apertures of definite or appreciable size, each aperture being circumscribed and separated from the other by integral or rigidly united material, porous material adapted and applied for preventing the ore from falling through said apertures, together with means for forcing air up-

wardly through said porous material and apertures and into the ore resting upon the said hearth or bed.

7. A metallurgical furnace comprising a 5 hearth or bed of hard material provided with apertures of definite or appreciable size, each aperture being circumscribed and separated from the other by integral or rigidly united material, porous material adapted and applied for preventing the load carried by the said hearth or bed from falling 10 through the said apertures, and means for forcing a fluid treating agent upwardly through the said porous material and apertures, and into the said load on the hearth 15 or bed.

8. A furnace for treating materials, comprising a hearth or bed composed of continuous and rigidly united hard material 20 provided with apertures of definite or appreciable size, porous means adapted and applied for preventing the materials carried on the hearth or bed from falling through the said apertures, and means for forcing a fluid 25 treating agent through the said porous material and apertures and into the materials on the said hearth or bed.

9. A roasting furnace for roasting gold

ore, or other ores, comprising a hearth or bed made of continuous and rigidly united 30 hard material and provided with a smooth and flat upper surface, said hearth or bed having apertures of definite or appreciable size, suitable means for preventing the pulverized ore, or other materials, carried by 35 the hearth or bed, from falling through the said apertures, and means for introducing air upwardly through said apertures and into the body of ore or other material carried by the said hearth or bed. 40

10. In a furnace, a hearth all portions of which are held firmly and rigidly against either lateral or upward displacement, openings in said hearth, porous means for preventing the material on the hearth from falling 45 through said openings, and means for forcing a fluid through the porous material and openings and into said material on the hearth.

Signed by me at Chicago, Cook county, 50 Illinois, this 17th day of February, 1903.

CHARLIE E. MARK.

Witnesses:

DAISY OVERBAUGH,
WM. A. HARDERS.