

(No Model.)

M. KEARNEY & M. C. HAWLEY.

FIRE BOX FOR LOCOMOTIVES.

No. 255,869.

Patented Apr. 4, 1882.

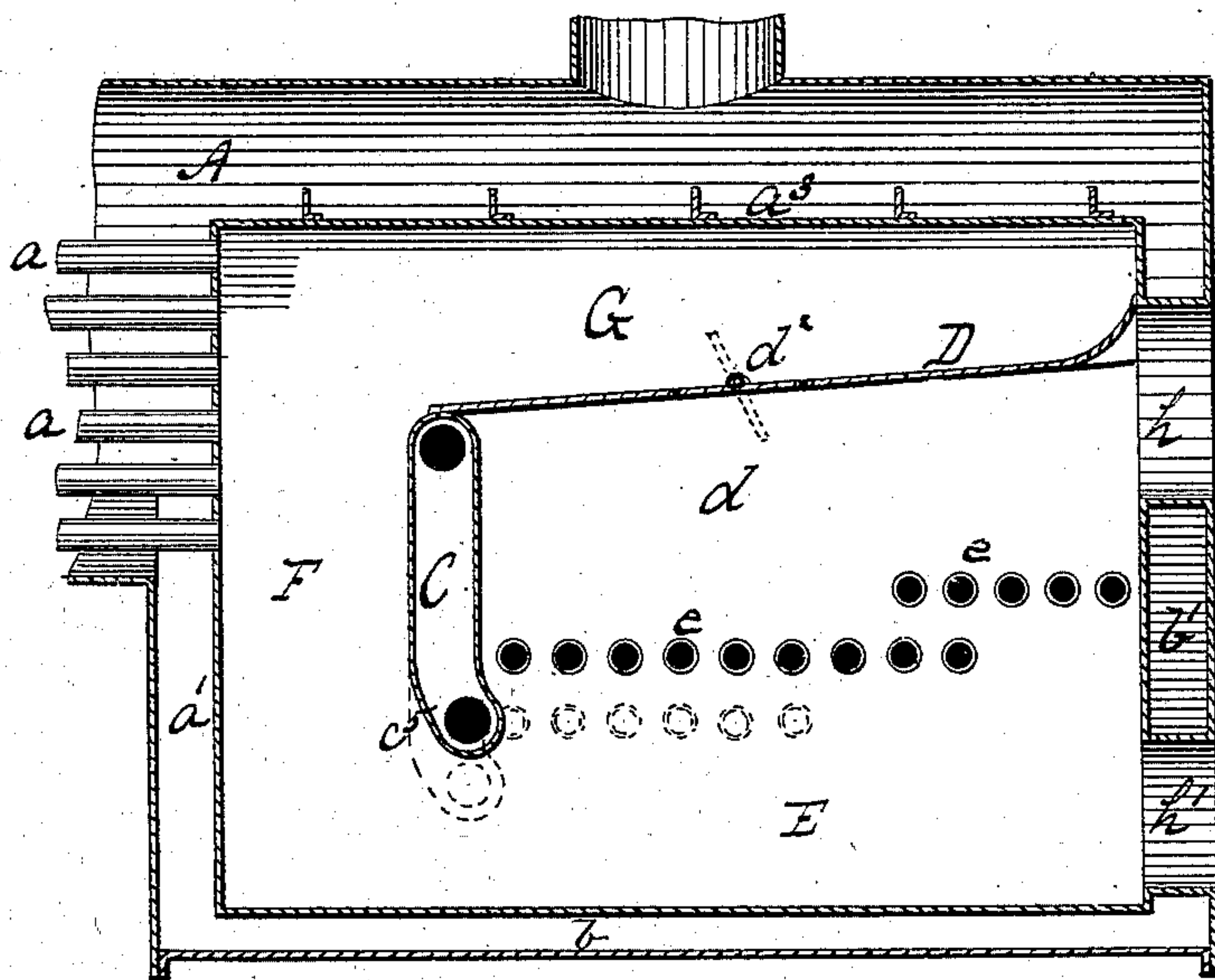


Fig. 1

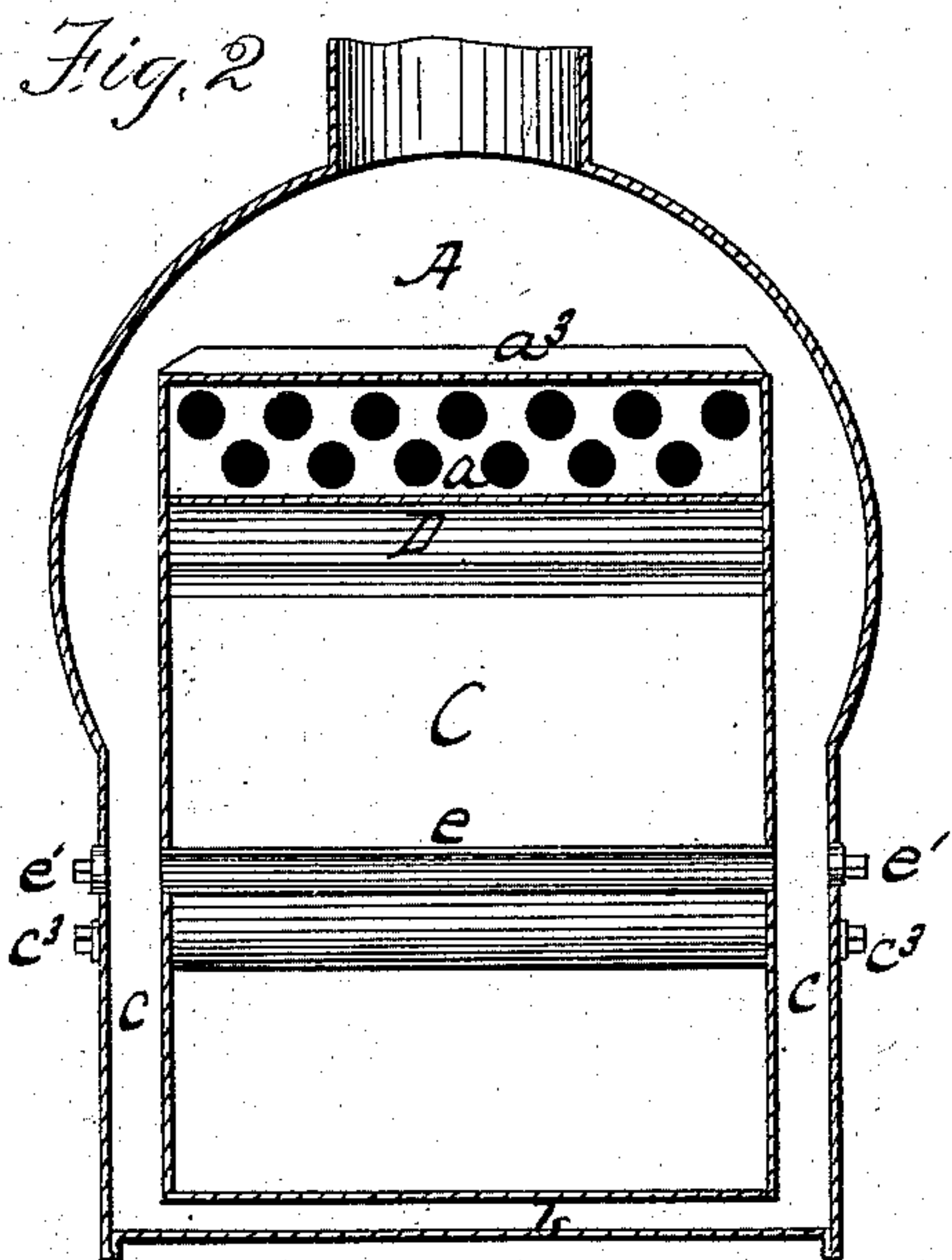


Fig. 2

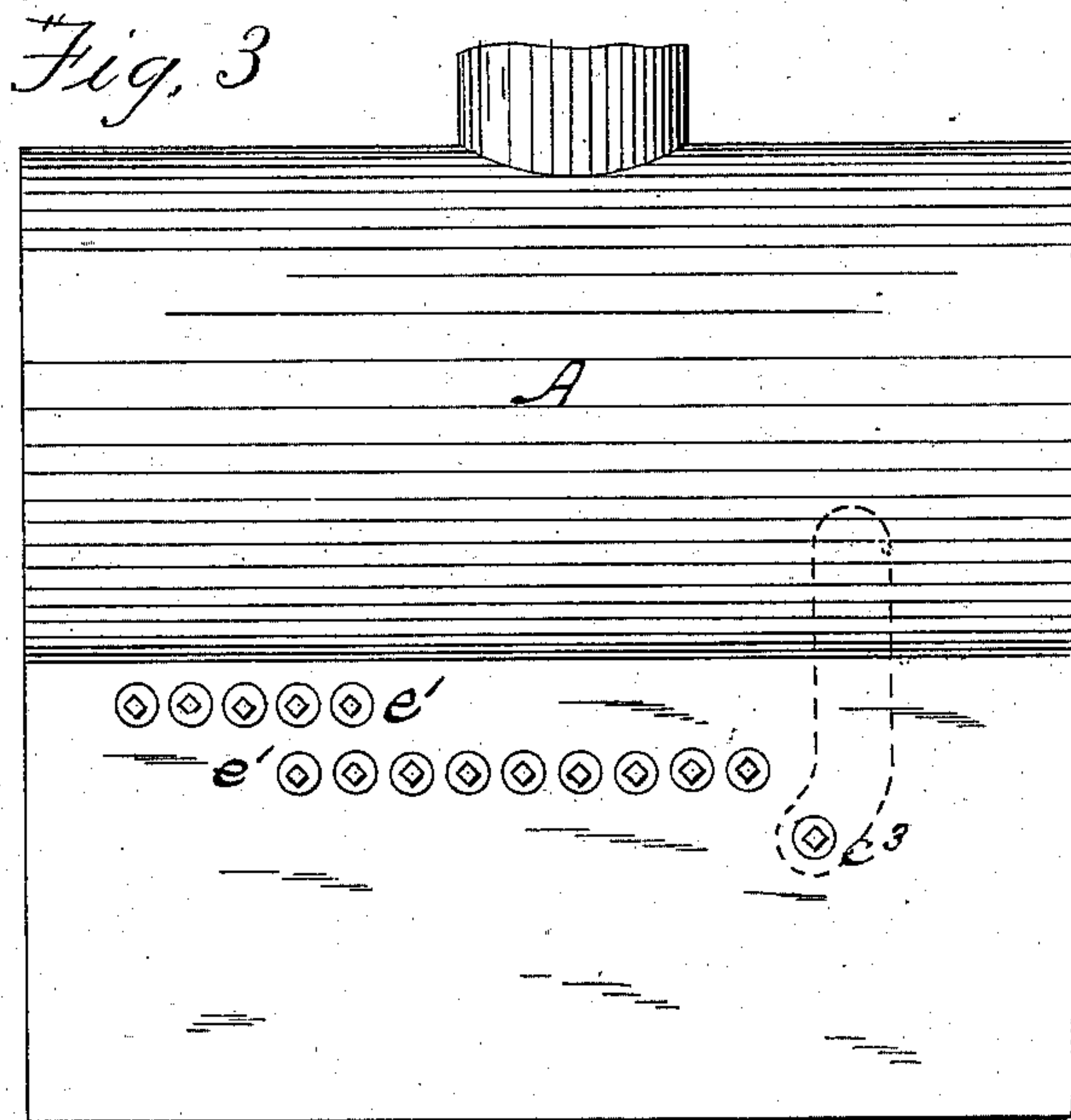


Fig. 3

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UNITED STATES PATENT OFFICE.

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FIRE-BOX FOR LOCOMOTIVES.

SPECIFICATION forming part of Letters Patent No. 255,869, dated April 4, 1882.

Application filed January 4, 1882. (No model.)

To all whom it may concern:

Be it known that we, MICHAEL KEARNEY, residing at North Springfield, Greene county, and MELVILLE C. HAWLEY, residing at St. Louis, both in the State of Missouri, citizens of the United States, have invented certain new and useful Improvements in Fire-Boxes for Locomotive and other Boilers; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of a fire-box embodying our invention. Fig. 2 is a transverse vertical section, and Fig. 3 is a side elevation.

Like letters refer to like parts wherever they occur.

Our invention relates to that class of furnaces or fire-boxes for locomotive and like boilers which operate on the downdraft or base-burning principle, and has for its objects to enlarge the area of the heating-surface of the furnace, increase the strength and durability of the construction, to facilitate the making of repairs when needed, to economize fuel, and in a great measure, if not entirely, prevent the formation of smoke.

To this end it consists mainly in such relative arrangement of the pendent water-partition, the grate, and a bottom water-space, which is continuous with the boiler, as will cause the flame, &c., to impinge on the bottom water-space, whereby the heating of the boiler-water is facilitated, the temperature of the furnace-walls preserved sufficiently high to permit complete combustion and prevent the deposit of carbon or formation of soot, and the wear on the furnace is limited to a position where repairs can be most readily made.

It consists, secondarily, in such arrangement of the fire-box arch or diaphragm above the fire-box with relation to the crown-sheet and pendent water-partition as shall provide an expansion-chamber for the gases and products of combustion within the furnace and prevent the draft from impinging on the crown-

sheet, so as to abstract heat therefrom, and also so as to enlarge the heating-surface of the furnace; and, finally, in specific combinations and in details of construction, which will hereinafter more fully appear.

Before proceeding to specifically describe the construction we have found best adapted to obtain the objects set forth above, we wish to distinctly state that we are aware that downward-draft furnaces have heretofore embraced in their construction pendent water-partitions and tubular grate-bars, such elements communicating with the water-space of the boiler, so as to permit a circulation of water through the same, and therefore do not herein broadly claim such elements, either singly or in combination; but, so far as we are aware, the arrangement of these elements has not been such as to cause the flame to impinge on the water-space forming the floor of the ash-pit and to prevent the downdraft from abstracting heat from the water-spaces of the fire-box, which are the special features of our invention, and are material for the following reasons: First, because in order to prevent the deposit of carbon or formation of soot it is essential to keep the walls of the furnace on which the flame and products impinge at a high temperature; secondly, because the walls upon which the flames impinge are destroyed more rapidly than other portions of the furnace, and therefore should be so located as to be most readily repaired; and, thirdly, because in case a deposit of soot, &c., takes place it should be caused to do so, not in the less accessible flues, but where it is comparatively unobjectionable and can be readily removed—as, for instance, in the ash-pit.

Having thus distinctly indicated the scope of our invention, we will now proceed to describe a construction adapted to produce the desired results, so that others skilled in the art to which it appertains may apply the same.

In the drawings, A indicates a boiler, which in the present instance is a locomotive-boiler, having flues *a*, communicating water-legs *a'* *b' c c*, and water-bottom *b*, which form continuous water chambers, inclosing the furnace.

d indicates the fuel-chamber, which is formed by a series of tubular grate-bars or pipes, $e e$, extending transversely across the furnace and communicating with the water-legs $c c$ of the boiler, a vertical water-table or pendent partition, C , which also extends transversely across the furnace and communicates with the water-legs $c c$, and a fire-box arch or diaphragm, D , which extends from the inner wall of the water-leg b' above the draft-door, thence forward to the water-partition C .

The tubular grate-bars may be arranged in a single line at such a distance apart as will permit the free passage of the products of combustion, but, in order to facilitate the feeding down of the fuel, the escape of the products of combustion and ashes, are preferably arranged in two or more broken lines or in steps, as indicated by dotted lines, Fig. 1. In the outer shell of the boiler, opposite the ends of the tubular grate-bars, are a series of plugs, e' , which may be removed for the purpose of cleaning out the bars or for removing worn and replacing new bars. The vertical water-table or pendent partition C is arranged at the front of the grate and at such distance from the flue-sheet as to leave an ascending flue or combustion-space, F , into which the products of combustion escape from the ash-pit E . This partition C is extended above the grate sufficiently to obtain a desirable depth for fuel in chamber d and also a space between the top of the fuel and the bottom plane of diaphragm D for the introduction and circulation of air necessary to support combustion, and it projects below the grate sufficiently to direct the heat and flames in effective proximity or in direct contact, as may be desirable, with the water-space b at the bottom of the fire-box.

The lower end of water-partition C may be curved or inclined, as at c^5 , to increase the deflection of the flame and products of combustion. In the outer shell of the boiler, opposite the lower part of partition C , is a plug, c^3 , for cleaning out the partition C .

The top of the fuel-chamber is closed by a diaphragm, D , which extends from side to side across the furnace-chamber, and from the inner wall of the water-leg b' to the top of the partition C , and may, if desired, be provided with a draft-door, d^2 . This diaphragm is above the draft-door h , and may be arranged parallel with the crown-sheet a^3 , or it may be inclined, as preferred, so long as an expansion and combustion chamber, G , is left between the top of the fuel-chamber and the crown-sheet.

The diaphragm serves to prevent the incoming air for supporting combustion from impinging on the crown-sheet and obstructing heat from the water-spaces or from passing directly to the flues, and causes it to descend through the fresh and the incandescent fuel.

At the bottom of the boiler, under the ash-box and combustion-chamber, is a water-space, b , which connects with and opens into the front, back, and side water-spaces, thus making a con-

tinuous water-space. This bottom water-space is formed by a top and bottom sheet, the top one being the sheet which forms the bottom of the ash-box, and the bottom sheet being the lower outside shell of the boiler. The lower sheet of outside shell of boiler, instead of being flanged, so as to necessitate riveting on the inside of the fire-box, is backed up in flanging, so that all riveting is done on the outside.

h indicates a fuel and draft door for the fuel-chamber, and h' a door for the ash-pit.

The construction being substantially as specified, the fire may be started by means of the upward draft through door h' and draft-door d^2 of diaphragm D , if preferred, after which, the ash-pit door h' and draft-door d^2 being closed and the door h of the fuel-chamber being opened, the draft will be downward through the fresh fuel, causing the gases to pass through the incandescent fuel. The incoming air, being deflected by the diaphragm D , will not impinge on or abstract heat from the crown-sheet, and the flame, &c., being directed by the downward projection of the water-partition C , will impinge on the bottom of the ash-pit. The plates forming the bottom of the ash-pit or the ashes, &c., thereon, will thus be maintained at a temperature which will prevent the deposit of carbon, or, if any soot is formed, it will be deposited in the ash-pit, whence it can be readily removed through the ash-pit door. The greatest wear and tear of the furnace will thus be brought on plates which can be readily renewed, and the furnace will consequently be rendered more durable. The products of combustion will then pass from the ash-pit E into the flue F on their way to the flues a , and the combustion-chamber G , above the fuel-chamber and between the same and the crown-sheet, will not only give an increased heating-surface, but will permit such expansion of the gases, &c., as will insure complete combustion within the furnace and prevent the choking of flues a . The step or broken-line arrangement of the tubular grate will not only facilitate the feeding down of the fuel and the removal of ashes, but will assist in directing the products of combustion toward the rear of the ash-pit, or, in other words, toward the ash-pit door. By means of the plugs in the outer shell of the boiler the tubular bars and the pendent water-partition may be cleaned out at will. Worn bars may be removed and new bars inserted.

Having thus set forth the nature and advantages of our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a downdraft-furnace of the class shown, the combination, with a tubular water-grate composed of two or more lines of transverse tubular bars and a water-space which forms the bottom of the ash-pit, said water-space communicating with the boiler, of a pendent partition, which forms the front wall of the fuel-chamber, projects below the grate, and causes the flame and products of combustion to im-

pinge on the water-space, substantially as and for the purpose specified.

2. The combination, with a grate, of a pendent partition, which projects below the grate and is inclined or bent at a point below the grate to increase the deflection of the flame and products of combustion, substantially as and for the purpose specified.

3. The combination of a grate composed of two or more broken lines of transverse bars, with a vertical partition, which projects below the bars and is inclined or bent to increase the deflection of the flame and products of combustion, substantially as and for the purpose specified.

4. The combination of the grate composed of two or more broken lines of transverse tubular bars with the pendent water-partition, which projects below the bars, the water-partition and the bars communicating with the water-legs of the boiler, substantially as and for the purpose specified.

In testimony whereof we affix our signatures, in presence of two witnesses, this 31st day of December, 1881.

MICHAEL KEARNEY,
MELVILLE C. HAWLEY.

Witnesses:

EDGAR G. CHADWICK,
JOHN WRAY.