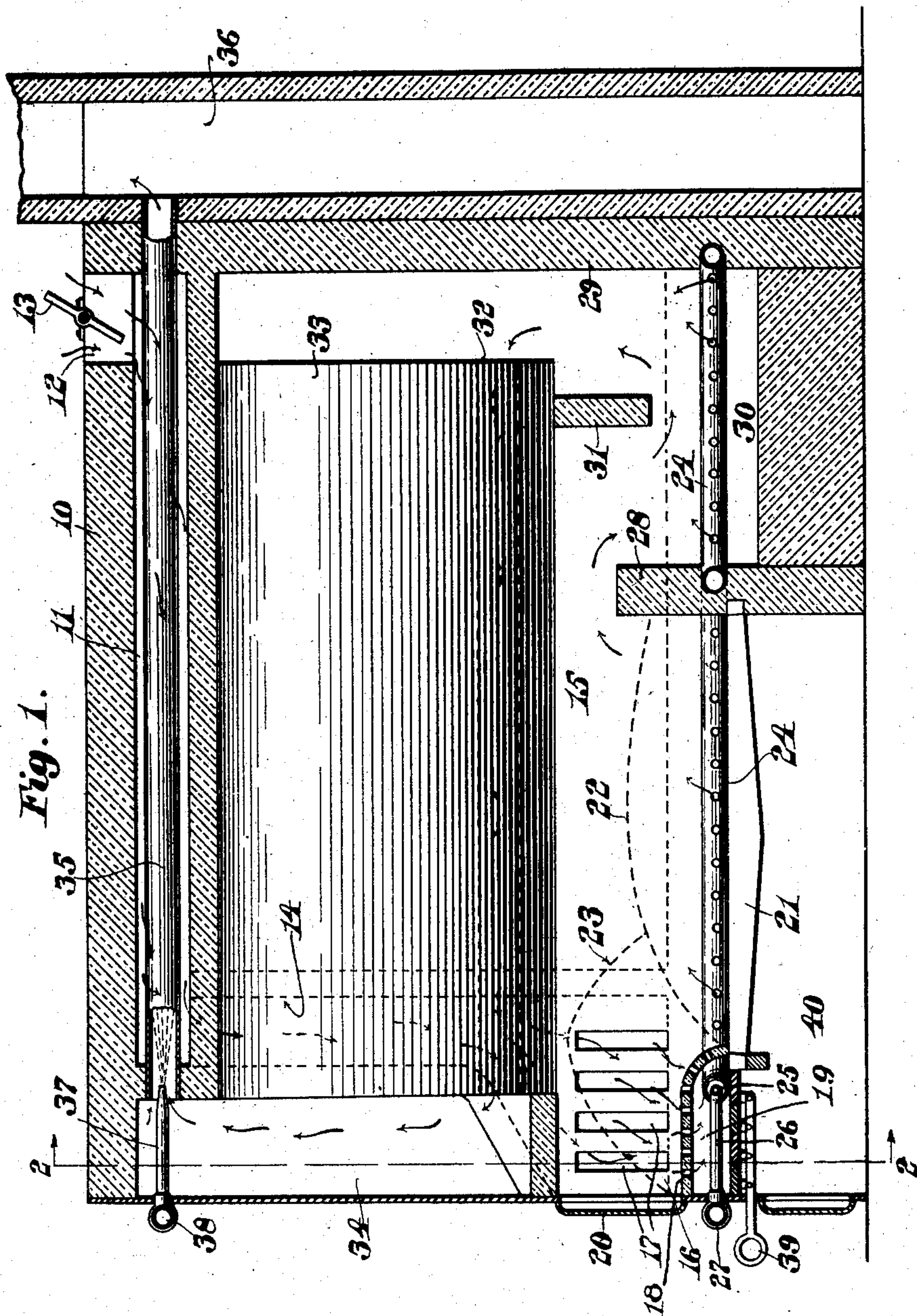


No. 865,209.

PATENTED SEPT. 3, 1907.

W. H. RICKER.
COMBUSTION APPARATUS.
APPLICATION FILED MAR. 20, 1907.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 2.

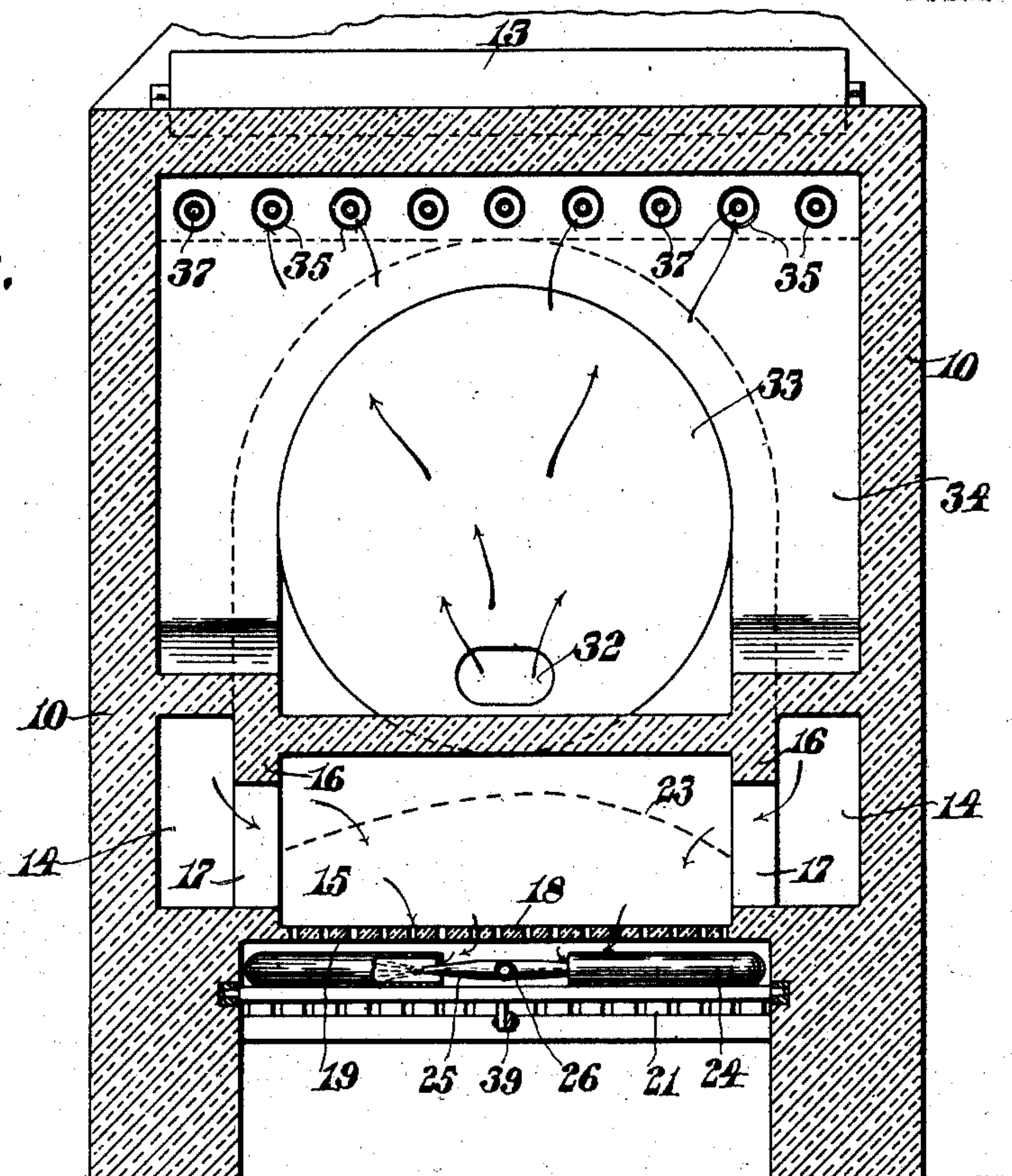
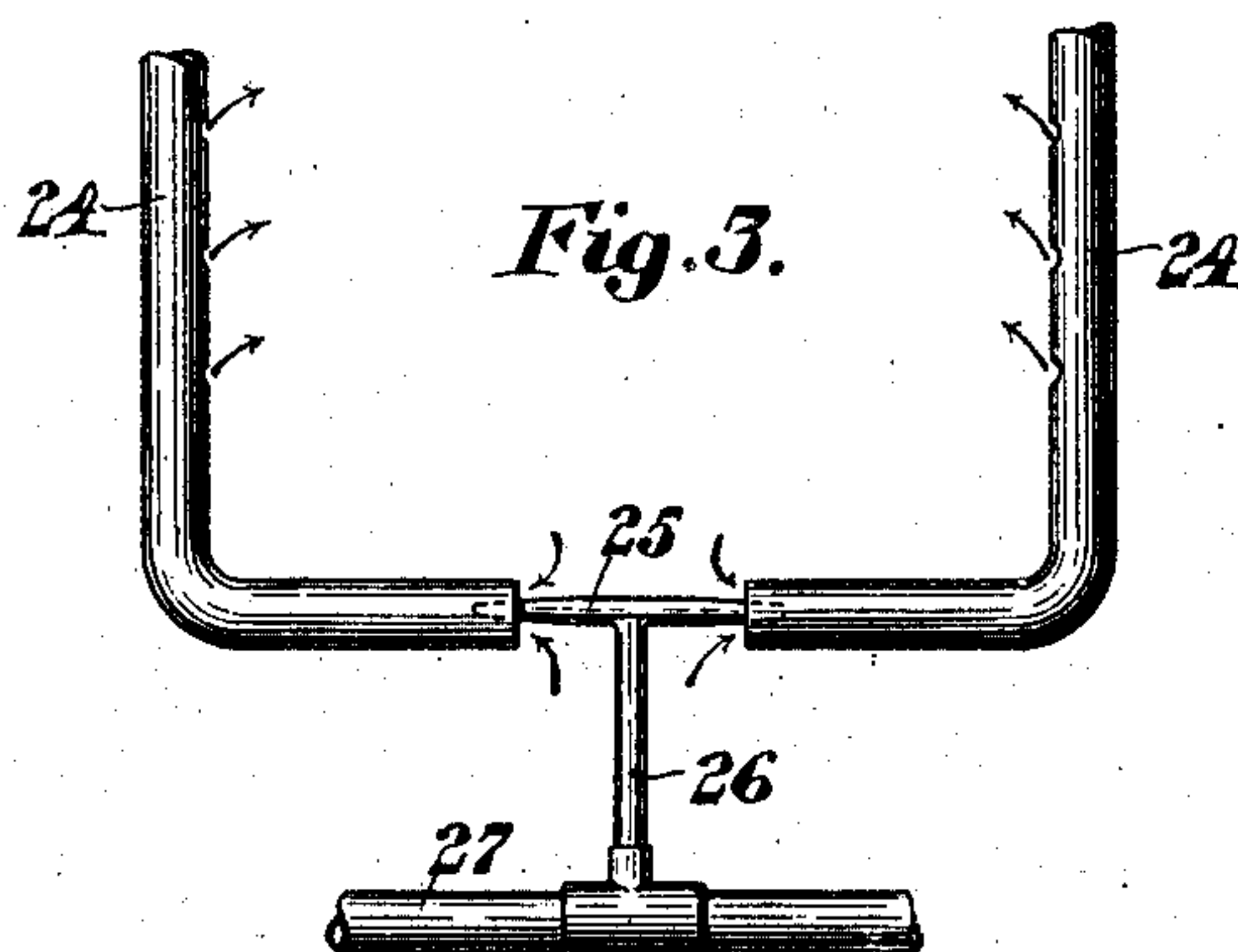


Fig. 3.



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UNITED STATES PATENT OFFICE.

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COMBUSTION APPARATUS.

No. 865,209.

Specification of Letters Patent.

Patented Sept. 3, 1907.

Application filed March 20, 1907. Serial No. 363,373.

To all whom it may concern:

Be it known that I, WILLIAM H. RICKER, a citizen of the United States of America, and a resident of Cambridge, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Combustion Apparatus, of which the following is a specification.

This invention relates to furnaces or heaters adapted to produce hot air for heating purposes and has for its object the production of an apparatus in which coal dust and other waste materials are capable of being utilized and in which the air currents are caused to pass through the fire-pot in circular currents and through the fresh coal contained therein to be finally fed into the center of the fire.

The invention is an improvement on another invention of mine patented Sept. 18, 1906, No. 831,299.

It consists in certain novel features of construction and arrangement of parts which will be readily understood by reference to the description of the drawings and to the claims hereinafter given.

Of the drawings: Figure 1 represents a longitudinal section of a furnace or heater embodying the features of this invention. Fig. 2 represents a transverse section of the same, the cutting plane being on line 2—2 on Fig. 1, looking in the direction of the arrow, and Fig. 3 represents a plan of a suction device for forcing heated air and gas into the mass of burning coal.

In the drawings, 10 represents the wall of the furnace or heater which is provided near its top with a chamber 11 having an opening at 12 through which air is admitted to said chamber, this inlet opening 12 being controlled by means of the damper 13. The inlet 12 is at the rear end of the chamber 11, the opposite end of which communicates with a downward passage 14 separated from the fire-pot 15 by the walls 16 through which openings 17 extend forming a communication between the fire-pot 15 and the passage 14.

At the front end of the fire-pot 15 is a perforated casing 18 forming a chamber 19, the top of which is slightly below the level of the fire door 20. To the rear of the casing 18 is the usual grate 21 upon which the burning coals are placed as indicated by the dotted line 22. Fresh coals are inserted into the front end of the fire-pot as indicated by the dotted line 23, these coals extending partly over the burning coals 22 and over the casing 18, as shown clearly in Fig. 1 of the drawings. At each side of the fire-pot 15 and extending throughout the length thereof is a perforated pipe 24, the front end of which is open and has extending into the mouth thereof a steam nozzle 25, these nozzles forming a part of the branch pipe 26 extending from the steam pipe 27 from any suitable source of supply.

The back wall 28 of the fire-pot forms with the back wall 29 of the furnace a chamber 30 into which extends the downwardly projecting baffle plate or wall 31 caus-

ing the heated gases and products of combustion to pass over the top of the back wall 28 and downwardly under the baffle plate 31 and then again upwardly through the pipe 32, shown only in dotted lines extending through the boiler 33. All of the heated gases and flames from the fire-pot 15 are concentrated in the center of this chamber 30, making this chamber extremely hot and suitable for roasting metals or for similar purposes. The opposite end of said pipe 32 communicates with the chamber 34 with which the front ends of a plurality of pipes 35 communicate. These pipes 35 extend longitudinally of the chamber 11 from the chamber 34 to the chimney 36 and a steam nozzle 37 extends into the mouth of each of the pipes 35, said nozzles communicating with a steam pipe 38 connected with any suitable source of supply.

The bottom of the chamber 19 is movable and operated by the handle 39 so that any dirt which may collect therein may be readily dumped into the ashpit 40 beneath the grate 21.

In the operation of the invention the damper 13 is opened sufficiently to admit the required amount of fresh air which passes through the chamber 11 to the passage 14, the air passing through the chamber becoming gradually heated by its proximity to the plurality of heated pipes 35 through which the products of combustion are passing to the chimney 36, this passage of the products of combustion being facilitated by the suction created therein by means of the steam nozzles 37. As the burning coals on the grate 21 are all at the rear of the fire-pot and fresh coals only are at the front end, these coals are gradually heated to remove certain of the gases therefrom. The fresh air in passing downward through the passage 14 and through the openings 17 will combine with these heated gases and be drawn through the perforations in the casing 18 into the chamber 19 from which the suction created by the steam nozzles 25 in the pipes 24 will draw them through said pipe and emit them through the perforations therein into the mass of burning coal, thereby greatly facilitating the combustion and providing a ready means of burning small particles of coal and dust which would otherwise remain unburned. The action of the heat of the burning coals upon the fresh coal, removing the gases therefrom, causes the fresh coal to be prepared in a better condition for combustion, when it is desired to push these coals backward into the rear end of the fire-pot to mix them with the live coals. When this is done a fresh supply of coal will be placed in the front end of the fire-pot to replace those removed therefrom.

By such a construction of combustion apparatus as is herein shown and the methods herein used, not only are all the small particles of carbon utilized and burned but the carbon di-oxid is also prevented from mixing with the heated gases of the fresh coal and thus destroying their usefulness. On the contrary these heated

gases are kept in condition to be utilized to advantage and are delivered to the mass of burning coal at comparatively the same temperature as that of the burning coals, thus avoiding any injurious effect thereon.

Moreover all of the hot gases are utilized in a combustion apparatus of this construction while by means of the suction apparatus used the fresh air is continually admitted to the fire-pot and mixed with the burning carbon therein to consume the same. The heated gases escaping from the fire-pot into chamber mix with the fresh heated air and gas passing from the pipe 24 and produce in this chamber an intense heat, as has been heretofore described.

It is believed from the foregoing the operation and the many advantages of an apparatus of this class will be thoroughly understood without any further description.

Having thus described my invention, I claim:

1. In a combustion apparatus, the combination of a fire-pot; means for admitting air to the front end of said fire-pot; a chamber at the front end of said fire-pot communicating therewith by a plurality of perforations; a perforated pipe extending along each side of said fire-pot and communicating with the interior of said chamber; and a steam nozzle extending into the mouth of each pipe adapted to draw some of the heated gases directly from said fire-pot through the perforations in said chamber casing into said chamber and to force them therefrom into said fire-pot through said pipes.

2. In a combustion apparatus, the combination of a fire-pot; means for admitting air to the front end of said fire-pot; a chamber at the front end of said fire-pot communicating therewith by a plurality of perforations; a movable bottom to said chamber; a perforated pipe extending along each side of said fire-pot and communicating with the interior of said chamber; and a steam nozzle extending into the mouth of each pipe adapted to draw some of the heated gases directly from said fire-pot through the perforations in said chamber casing into said chamber and to force them therefrom into said fire-pot through said pipes.

3. In a combustion apparatus, the combination of a fire-pot; means for admitting air to the front end of said fire-pot; a chamber at the front end of said fire-pot communicating therewith by a plurality of perforations; means for opening and closing the bottom of said chamber; a perforated pipe extending along each side of said fire-pot and communicating with the interior of said chamber; and a steam nozzle extending into the mouth of each pipe adapted to draw some of the heated gases directly from said fire-pot through the perforations in said chamber casing into said chamber and to force them therefrom into said fire-pot through said pipes.

4. In a combustion apparatus, the combination of a fire-pot; means for admitting air to the front end of said fire-pot; a chamber at the front end of said fire-pot communicating therewith by a plurality of perforations; a perforated pipe extending along each side of the fire-pot and communicating with the interior of said chamber; and a device within said chamber for creating a suction and adapted to draw some of the heated gases directly from said fire-pot through the perforations in said chamber casing into said chamber and to force them therefrom into said fire-pot through said pipes.

5. In a combustion apparatus, the combination of a fire-pot; a chamber at the front end of said fire-pot and communicating therewith by a plurality of perforations; air passages surrounding said fire-pot and communicating therewith through a plurality of perforations; a perforated pipe extending along each side of said fire-pot and communicating with the interior of said chamber; and a steam nozzle extending into the mouth of each pipe adapted to draw some of the heated gases directly from said fire-pot through the perforations in said chamber casing into said chamber and to force them therefrom into said fire-pot through said pipes.

6. In a combustion apparatus, the combination of a fire-pot; a chamber above said fire-pot and separated therefrom; a plurality of pipes extending lengthwise of said chamber and communicating at one end with the chimney and at the other indirectly with said fire-pot; means for admitting air to said chamber around said pipes; means for admitting said air to the front end of the fire-pot; a perforated chamber at said front end; a perforated pipe extending therefrom at each side of the fire-pot; and a suction device cooperating therewith to force air and gases up through the coal in the fire-pot where combustion is taking place.

7. In a combustion apparatus, the combination of a fire-pot; a chamber above said fire-pot and separated therefrom; a plurality of pipes extending lengthwise of said chamber and communicating at one end with the chimney and at the other indirectly with said fire-pot; means for admitting air to one end of said chamber around said pipes; means for admitting said air to the front end of the fire-pot from the opposite end of said chamber; a perforated chamber at said front end; a perforated pipe extending therefrom at each side of the fire-pot; and a suction device cooperating therewith to force air and gases up through the coal in the fire-pot where combustion is taking place.

8. In a combustion apparatus, the combination of a fire-pot; a chamber opening to the air; pipes in said chamber for the passage of the products of combustion escaping from said fire-pot; a passage communicating with said chamber; a plurality of openings from said passage to the front of said fire-pot above the unburned coal therein; a second chamber below the unburned coal with perforations in its upper wall; conduits communicating with said last-mentioned chamber and extending into said fire-pot; and means within said second chamber to indraw air through said perforations, unburned coal, and air chamber, and force said air through said conduit up through the coal in said fire-pot where combustion is taking place.

9. In a combustion apparatus, the combination of a fire-pot; a chamber opening to the air; a passage communicating with said chamber; a plurality of openings from said passage to the front of said fire-pot above the unburned coal therein; a second chamber below the unburned coal with perforations in its upper wall; conduits communicating with said last-mentioned chamber and extending into said fire-pot; means within said second chamber to indraw air through said perforations, unburned coal, and air chamber, and force said air through said conduits up through the coal in said fire-pot where combustion is taking place; a series of pipes leading through said air chamber indirectly communicating at one end with the fire-pot; and a steam jet adapted to force the hot gases from the fire-pot through said pipes.

10. In a combustion apparatus, the combination of a fire-pot; a chamber opening to the air; pipes in said chamber for the passage of the products of combustion escaping from said fire-pot; a passage communicating with said air chamber; a plurality of openings from said passage to the front of said fire-pot above the unburned coal therein; a second chamber below the unburned coal with perforations in its upper wall; conduits communicating with said last-mentioned chamber and extending into said fire-pot; and a steam jet adapted to draw air through said perforations, unburned coal, and air chamber, and force it through said conduits to the portion of the fire-pot where combustion is taking place.

11. In a combustion apparatus, the combination of a fire-pot; a chamber opening to the air; pipes in said chamber for the passage of the products of combustion escaping from said fire-pot; a passage communicating with said air chamber; a plurality of openings from said passage to the front of said fire-pot above the unburned coal therein; a second chamber below the unburned coal with perforations in its upper wall; a conduit communicating with said second chamber and having perforations in one portion admitting air to the coal in process of combustion, and in another portion having perforations admitting air to the flame and gases after said flame and gases have left the immediate vicinity of the fire-pot; and means within said second chamber to indraw air through

said perforations, unburned coal, and air chamber, and force said air through said conduits.

12. In a combustion apparatus, the combination of a fire-pot; a chamber opening to the air; pipes in said chamber for the passage of the products of combustion escaping from said fire-pot; a passage communicating with said air chamber; a plurality of openings from said passage to the front of said fire-pot above the unburned coal therein; a second chamber below the unburned coal with perforations in its upper wall; a conduit communicating with said second chamber having perforations in one portion admitting air to the coal in process of combustion, and in another portion having perforations ad-

mitting air to the flame and gases after said flame and gases have left the immediate vicinity of the fire-pot; 15 means within said second chamber to indraw air through said perforations, unburned coal, and air chamber, and force said air through said conduit, and to thoroughly mix said air with said flame and gases.

Signed by me at Boston, Mass., this 16th day of March, 20 1907.

WILLIAM H. RICKER.

Witnesses:

WALTER E. LOMBARD,
EDNA C. CLEVELAND.