

May 4, 1926.

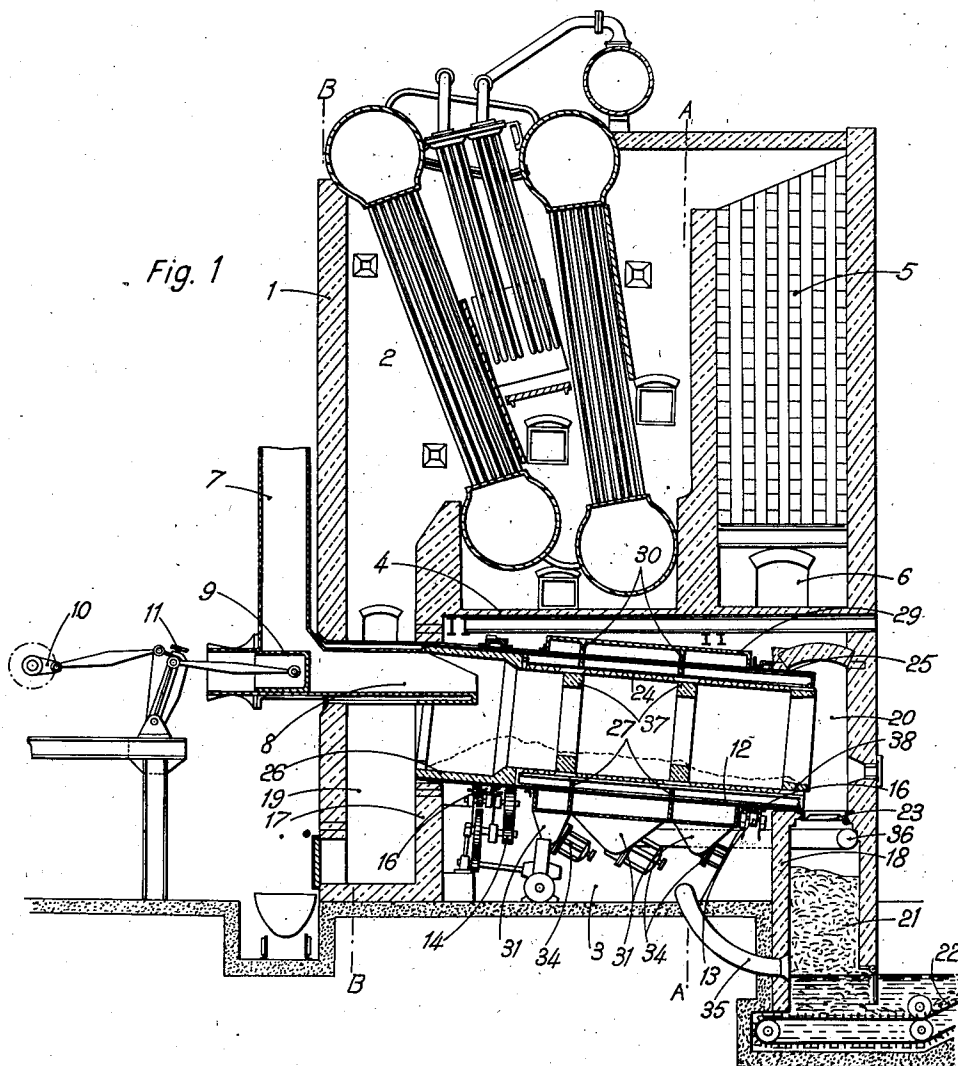
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J. S. ATKINSON

FURNACE FOR THE COMBUSTION OF FUEL

Filed Nov. 3, 1923

3 Sheets-Sheet 1



INVENTOR

JAMES STANLEY ATKINSON

By *O'Neill and Bunn*
ATTORNEYS.

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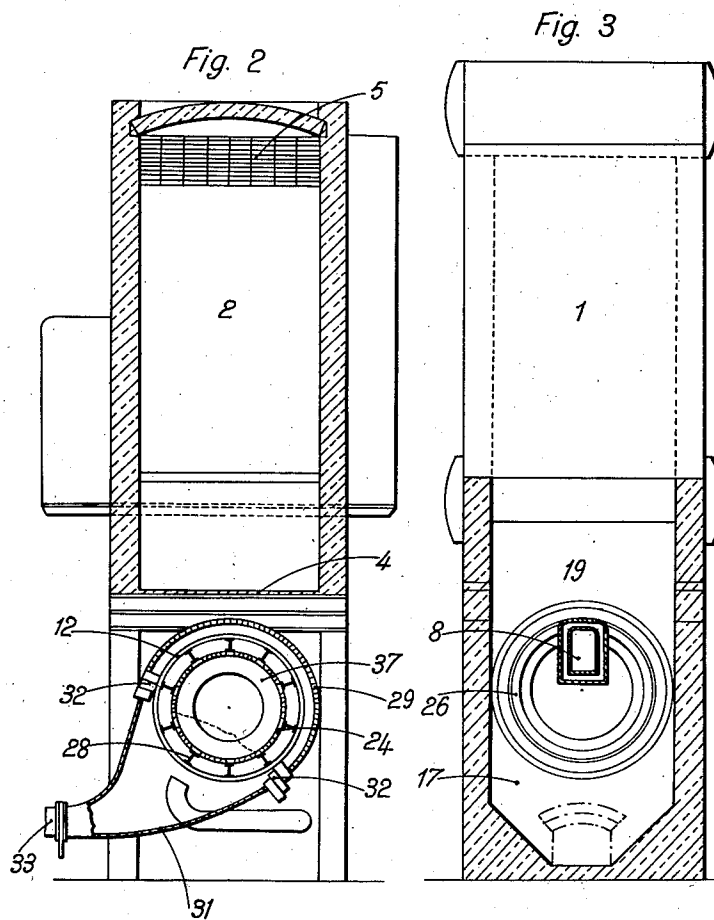
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3 Sheets-Sheet 2



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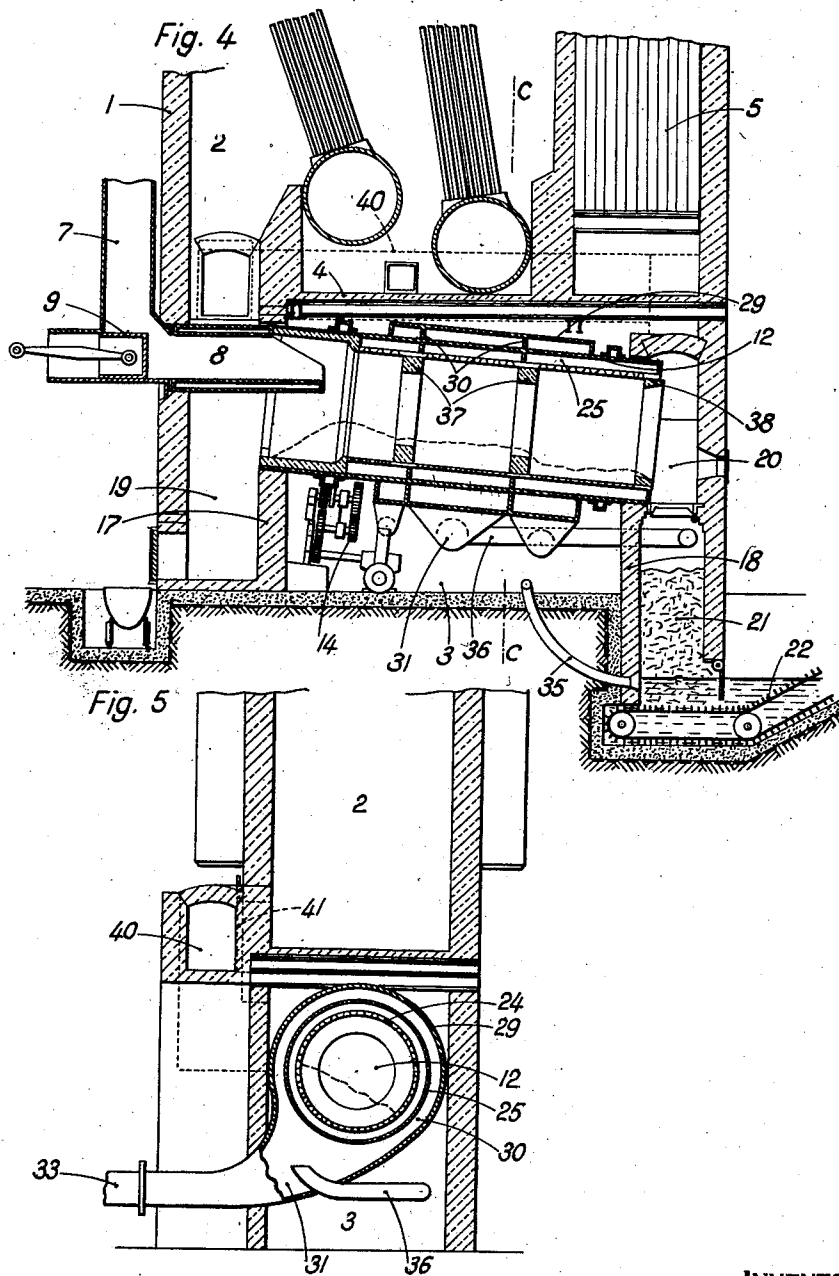
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3 Sheets-Sheet 3



INVENTOR

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Patented May 4, 1926.

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UNITED STATES PATENT OFFICE.

JAMES S. ATKINSON, OF LONDON, WESTMINSTER, ENGLAND, ASSIGNOR TO SOCIÉTÉ ANONYME DES APPAREILS DE MANUTENTION & FOURN STEIN, OF PARIS, FRANCE.
A CORPORATION OF FRANCE.

FURNACE FOR THE COMBUSTION OF FUEL.

Application filed November 3, 1923. Serial No. 672,628.

To all whom it may concern:

Be it known that I, JAMES STANLEY ATKINSON, a subject of the King of Great Britain, residing at London, Westminster, Great Britain, and having post-office address 47 Victoria Street, in the said city, have invented certain new and useful Improvements in Furnaces for the Combustion of Fuel; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention of improvements in or in connection with furnaces for the combustion of fuel has reference, in particular, to furnaces for the destruction of city or other refuse, but is also applicable in connection with furnaces for the combustion of other solid fuel. The term "fuel" employed herein is intended to cover and include city or other refuse or other solid fuel.

The invention has chiefly for its object the provision of improvements by which the combustion of fuel shall be effected in an improved and more efficient manner.

A furnace for the combustion of fuel, in accordance with this invention, comprises a slotted or otherwise perforated and jacketed fuel carrier, a combustion chamber connected to one end of the fuel carrier and means for the supply of fuel to the same end of the fuel carrier, an ash or clinker receiver disposed at the other end of the fuel carrier, means to supply air to the jacket and therefrom to the fuel through the slots or other perforations of the fuel carrier and means to impart movement to the fuel carrier to cause the fuel to travel from one end thereof to the other.

In a modification of the means set forth, the ash or clinker discharge end of the fuel carrier is connected by a flue with a combustion chamber or apparatus to be heated and means, such as a damper or dampers, are provided to control the flow of hot gas and products of combustion through said flue.

In the preferred form of the invention, the whole of the products of combustion of the fuel flow to the combustion chamber in a direction opposite to that of the movement of the fuel along the fuel carrier, and in the modified form of the invention, the flow of

the products of combustion may be controlled and regulated in such wise that the flow is as in the preferred form or is divided into two streams, one flowing in the same direction as that of the movement of the fuel along the fuel carrier and the other in the opposite direction.

The fuel carrier preferably comprises a slotted or otherwise perforated cylinder or truncated cone, though it may comprise a slotted or otherwise perforated trough or channel like member. The fuel carrier is mounted with its longitudinal axis inclined to the horizontal and the fuel, which is delivered to the upper end thereof, is caused to move downwardly along the fuel carrier by imparting rotary, oscillatory, rocking or other movement thereto. The air for combustion is supplied to the jacket and passes from thence to the fuel through the slots or other perforations in the fuel carrier passing, preferably, only through the slots or perforations that are covered with fuel. In addition to air, steam may also be supplied to the jacket and from thence to the fuel. The passage of fuel from one end of the fuel carrier to the other, as also the depth of the fuel at one or more places, is regulated and controlled by projections or impedances which, in a fuel carrier of cylindrical or conical formation, are constituted of annular projections disposed and spaced apart within the fuel carrier.

In order that the invention, the nature and objects of which have been set forth, may be readily understood, reference will now be made to the two constructional embodiments illustrated in the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view of one constructional embodiment of a furnace for the destruction of refuse, combined with a water tube steam generator of the Woodeson type and an air heater;

Figures 2 and 3 are cross sectional views on the lines A—A and B—B respectively, of Fig. 1;

Figure 4 is a longitudinal sectional view of a modified construction of furnace;

Figure 5 is a cross sectional view on the line C—C of Figure 4.

Now referring specifically to the drawings:

1 is a brickwork structure that is divided

into an upper compartment 2 and a lower compartment 3 by a horizontal partition 4. The upper compartment 2 constitutes a combustion chamber and contains elements of a water tube steam generator, as also an air heater 5, which latter is of any well known construction. In the air heater 5 diagrammatically illustrated, the hot gases from the combustion chamber 2 enter the upper end, flow downwardly and pass from the lower end by a duct or flue 6 to the chimney or uptake. The lower compartment constitutes, inter alia, a chamber for the fuel carrier and appurtenant parts.

7 is a chute, external to the structure 1, to the upper end of which fuel is supplied and by which it is delivered to the outer end of a horizontal duct 8 that extends through the outer wall of the structure 1 within the portion of the compartment 3 that contains the fuel carrier hereinafter described and its appurtenant parts. The fuel supplied to the duct 8 through the chute 7 is delivered on to the fuel carrier by a pusher 9 that is operated by a crank 10 through stroke varying means 11 of well known construction.

The fuel carrier comprises a cylinder 12 that is mounted on rollers 13 and is rotated by an electric motor, not shown, through reduction gearing 14, the last member of which meshes with a circular rack formed on or attached to the exterior of the cylinder or a part thereon. In the constructional embodiment illustrated, one of the tracks or paths 16 on which the rollers 13 work, is constituted as or carries the circular rack. The mounting of the cylinder 12 is such that its longitudinal axis is inclined to the horizontal. The upper end of the cylinder 12 is contained within an opening in a wall 17 and the lower end extends through an opening in a wall 18. The walls 17-18 divide the lower compartment 3 into three parts or compartments, of which the central compartment constitutes a container for the fuel carrier 12 and its appurtenant parts, and the outer compartments a flue 19, which is in direct connection with the combustion chamber 2, and a duct 20, which forms an extension or continuation of an ash or clinker receiver 21. The flue 19 and duct 20 are also in direct connection with the interior of the fuel carrier 12. The ash or clinker receiver 21 is water sealed and the ash or clinker is removed therefrom by a conveyor 22. The ash or clinker receiver 21 may be cut off from connection with the duct 20 by a valve 23 that is operated from the exterior of the structure 1. The duct 8 extends across the flue 19 and is water cooled.

The cylinder 12 has a slotted or otherwise perforated lining 24 that constitutes with the cylinder 12 a jacket 25. The jacket 25 extends only for a portion of the length of

the cylinder 12, the portion not jacketed being lined with fireclay 26 or the like to constitute an imperforate hearth. The jacket 25 is divided into a plurality of compartments by transversely disposed partitions 27 and longitudinally arranged divisions 28. The jacketed portion of the cylinder 12 is partially enclosed by a casing 29 that is divided by partitions 30 disposed symmetrically with respect to the partitions 27 in the jacket 25. It will be seen from Figure 2 that the casing 29 extends around the upper and side portions of the cylinder 12. Below the cylinder 12, the casing 29 is continued as a plurality of funnel like extensions 31, each corresponding to a division of the casing 29. Each funnel like extension 31 and its corresponding division of the casing 29 is divided from one another by stoppers or closure members 32. These closure members 32 are initially set to shut off as large a section of casing 29 as desired, air being supplied through pipes 33, as described later and passing through the perforated lining 24 to the fuel. The air entry zone may thus be restricted to meet the requirements of different fuels. Each funnel like extension 31 is connected at its smaller end with a pipe 33, that is controlled by a valve 34. Each of the pipes 33 is connected with the outlet of a fan or blower, not shown, the inlet of which is connected with the outlet of the air heater 5 or with the atmosphere directly. Instead of a plurality of fans or blowers being employed, a single fan or blower may be used and its outlet connected to the several pipes 33. Steam pipe connections may be made with one or more of the funnel like extensions 31 so that steam may be supplied either alone or conjointly with the air to a division or divisions of the jacket. 35 is a pipe connected at one end with a fan or blower and at the other end with the ash or clinker receiver 21 above the water seal. 36 is another pipe in connection at one end with the upper part of the ash or clinker receiver 21 and at its other end with one of the funnel like extensions 31. 37 are rings that are mounted and spaced apart within the cylinder 12; in the embodiment illustrated, the rings 37 are spaced so as to coincide with the partitions 27 of the jacket 25. 38 is another ring placed adjacent to the lower end of the cylinder. The rings 37 are shown as of like dimensions, the ring 38 being of smaller dimensions.

From the foregoing description, it will be understood that fuel which is delivered to the upper end of the chute 7 passes to the duct 8 and is delivered therefrom by the pusher 9 on to the imperforate hearth 26 from which it passes on to the jacketed portion of the cylinder 12 and is set into combustion, the air, preheated or not, for com-

bustion of the fuel being supplied by the fan or fans or blower or blowers through the pipes 33, and, it may be, also through the pipe 35, ash or clinker receiver 21 and pipe 36, to the funnel like extensions 31 from which it passes to and through such compartments of the jacket 25 as are in communication therewith to the fuel within the fuel carrier. The supply of air to each division of the jacket is regulable independently. The fuel is caused by the rotation and inclination of the fuel carrier to travel from end to end thereof, the ash or clinker being discharged at the lower end and falling into the receiver 21. The air that is passed through the receiver 21 is heated by contact with the ash or clinker. The products of combustion of the fuel flow from the upper end of the cylinder 12, enter the flue 19 and pass from thence to the combustion chamber 2.

The fuel while on the imperforate hearth 26 is subjected to a drying action, and, it may be, to partial burning. The rings 37, 38 control the passage of fuel along the fuel carrier and cause it to assume levels of different heights. The rotation or other movement of the fuel carrier causes the fuel to change its position constantly, prevents the formation of chimneys through the fuel and maintains a constant density of fuel. The stoppers or closures 32 may be permanently fixed in the positions shown or may be adjustable around the cylinder 12 in order to vary the number or positions of the jacket compartments that receive air from the funnel like extensions 31. The volume of air supplied from each funnel like extension 31 to the jacket compartments in connection therewith is controllable by the valves 34 and the supply may be so regulated that the whole of the fuel is completely consumed in the fuel carrier. Or the air supply may be regulated so that the plant works in manner somewhat analogous to a gas producer, the whole or a portion of the fuel being gasified, the gas being burnt in the combustion chamber 2 and any partially gasified or unconsumed fuel being consumed on the fuel carrier. Further the air pressure or supply may be such that fine dust contained in the fuel is blown therefrom and passes to the combustion chamber 2 where it is burnt in manner similar to powdered fuel.

In the modification illustrated in Figures 4 and 5 the duct 20 is connected by a flue 40 with the combustion chamber 2, a damper 41 being placed in said flue and dampers on either side of the duct 8 to control the connection of the flue 19 with the combustion chamber 2. The flow of the products of combustion may be controlled and caused to

pass wholly to the combustion chamber 2 through the flue 19 or partly through the flue 19 and partly through the flue 40.

Claims:

1. In a furnace, a perforated fuel carrier leading thereinto, an air jacket surrounding said carrier, means for supplying air thru said jacket and into said carrier at non-communicating areas along the length of said carrier.

2. In a furnace as defined in claim 1, transversely extending partitions for dividing the carrier into communicating compartments.

3. In a furnace as defined in claim 1, transversely extending partitions for dividing the carrier into communicating compartments, the different areas for air entry communicating with the carrier compartments.

4. In a furnace as defined in claim 1, means for regulating the supply of air delivered to each area.

5. In a furnace, a perforated fuel carrier leading thereinto, an air jacket surrounding said carrier, means for supplying fuel to the receiving end of said carrier, means for dividing the air jacket into longitudinally and transversely extending compartments, means for leading air thru the jacket compartments into said carrier, and means for controlling the supply of air delivered to each jacket compartment.

6. In a furnace as defined in claim 1, means for dividing the air jacket to limit the area of air supply circumferentially.

7. A furnace for the combustion of fuel comprising a perforated carrier extending into the furnace, a jacket surrounding the carrier, means for rotating the carrier, fuel feeding means at the receiving end of the carrier, an ash receiver at the other end thereof, a combustion chamber, and means for leading a current of air through the jacket and carrier and discharging the air from the carrier into the combustion chamber.

8. A furnace for the combustion of fuel comprising a multi-chambered perforated carrier extending into the furnace, means for feeding fuel to the receiving end of said carrier, means for rotating said carrier, an ash receiver at the discharge end of said carrier, a jacket surrounding said carrier, a combustion chamber, means for leading a current of air through said jacket and into said carrier, and discharging the air from the carrier into said combustion chamber, and means for regulating the supply of air delivered to each compartment of the carrier.

In testimony whereof I affix my signature.
J. S. ATKINSON.