Sept. 18, 1923. 1,468,008

C. W. DYSON

PROCESS OF AND APPARATUS FOR BURNING POWDERED FUEL

Filed Nov. 18, 1922

Fig. 1

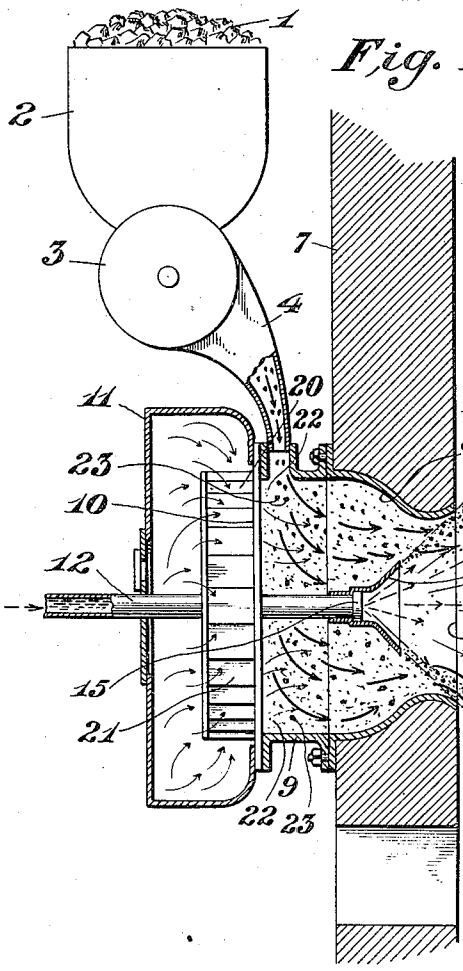



Fig. 4.

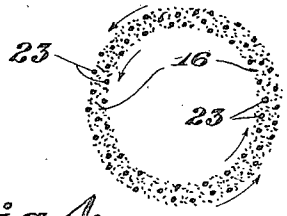
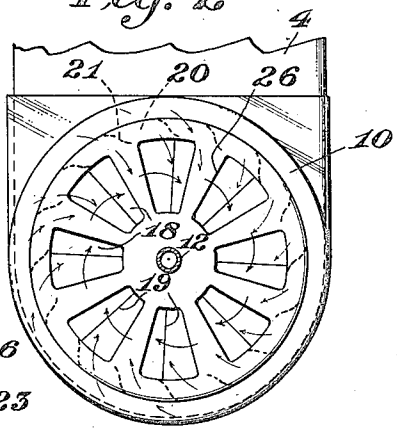



Fig. 2



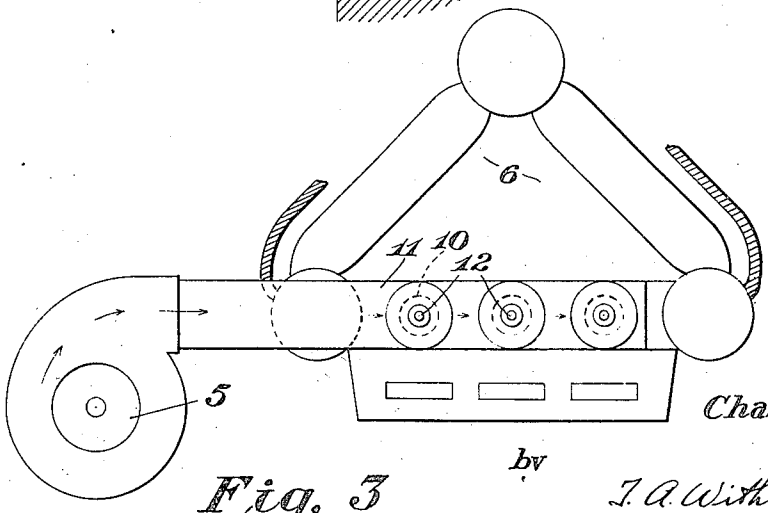




Fig. 3

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# UNITED STATES PATENT OFFICE.

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## PROCESS OF AND APPARATUS FOR BURNING POWDERED FUEL.

Application filed November 18, 1922. Serial No. 601,844.

*To all whom it may concern:*

Be it known that I, CHARLES W. DYSON, United States Navy, a citizen of the United States, at present residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Processes of and Apparatus for Burning Powdered 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 relates to a process of and an apparatus for burning powdered carbonaceous fuel, and has for its object to improve the procedures and devices of this nature which have been heretofore proposed.

With this and other objects in view, the invention consists in the novel procedure constituting the process and in the novel parts and combinations of parts constituting the apparatus, all as will be more fully hereinafter disclosed and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification, in which like numerals designate like parts in all the views:

Figure 1 is a diagrammatic sectional view of an apparatus made in accordance with this invention;

Figure 2 is an elevational view of a means for rotating the air admitted to the furnace, said means being shown as removed from the air conduit;

Figure 3 is a diagrammatic view showing an air conduit supplying a plurality of air rotating devices;

Figure 4 is a diagrammatic view taken on the line A—B of Figure 1, showing the rotating cone of mixed carbon and oil.

In order that this invention may be the better understood, it is said: It is well known that many prior devices have proposed the burning of finely divided carbon in furnaces, both with and without the admixture of oil therewith, but in all such procedures in so far as I am aware various objections have been met with, some of which were so serious in practice as to prevent an extended commercial use of this class of apparatus. Among the more serious objections was the lack of such a uniform and intimate mixture of carbon particles and air as would insure a smooth and uniform combustion in the furnace chamber. This objection was also enhanced by the fact that the inlets to the combustion chamber were not completely closed by the cone of carbon particles, thus admitting air in varying quantities to the flame and producing unsatisfactory results. In carrying out this invention, on the other hand, I overcome these objections, as well as others, not necessary to mention, all as will now be disclosed.

Referring more especially to Figures 1 and 2, 1 indicates any suitable supply of fuel carried by a hopper 2, feeding any suitable grinding or comminuting apparatus 3, from which leads the delivery spout or conduit 4. 6 indicates the combustion chamber of a furnace having a front wall 7 provided with a fuel inlet suitably lined as by the member 8, to which may be joined in any suitable manner the member 9, supporting the air rotating means 10. Said means 10 is surrounded by the conduit 11 carrying air under pressure, conveniently supplied by a blower 5. In Figures 1 and 2 a pipe 12 adapted to convey oil passes through the central portion of the rotator 10, and is provided on its furnace end 15 with a cone 13 so proportioned and positioned that an extension of the same would fill the furnace fuel inlet 17 as indicated by the lines 14. Said end 15 of the pipe 12 is also provided with any suitable and well known device not shown capable of atomizing or finely dividing the oil under pressure in pipe 12, and delivering it along the inner walls of the cone 13, in the form of a relatively thin rapidly rotating hollow cone, all as will be readily understood. This rapidly rotating hollow cone of oil expands as it leaves the cone 13, and passes through the fuel inlet as at 17 into the furnace when its rotating particles 16 separate and greatly thicken the walls of said oil cone, all as will be clear from Figures 1 and 5.

The air under pressure in the conduit 11 passes through the openings 18 in the face of the stationary rotator 10 and over the inclined blades 19. Said air also passes through the openings 20 in the rim of said rotator and over the inclined blades 21. The result is said air as it enters the chamber 22 from said rotator 10 is in rapid rotation due to its momentum, and the action of said inclined blades 19 and 21. The direction of rotation of said air is preferably

made the same as that of the oil particles 16. The finely divided carbon particles 23 fed into said chamber 22 by the feed chute or conduit 4 are rotated around the axis of said chamber by said air, and the pressure of the latter carries said particles 23 through said exit 17 into the furnace chamber 6 in the form of a whirling, rotating hollow cone, all as will be clear from the drawings.

It will thus be seen that the hollow whirling or rotating cone of finely divided carbon and the rapidly whirling or rotating cone 16 of atomized or finely divided oil become most thoroughly mixed. They both have to pass through the restricted exit 17 and they both are subjected to the rotating or whirling action of the air in the chamber 22 and as said cones of necessity have to expand as indicated, upon entering the furnace chamber 6, the particles in each cone separate from each other and thus apportion, so to speak, the air between themselves. The result is an unusually uniform mixture of air and fuel, whether it be oil alone or carbon alone or a mixture of oil and carbon. Now, the cones of finely divided carbon and of finely divided oil completely fill up the fuel inlet 17 to the furnace, so that no varying quantities of air are admitted to the furnace as is the case in the prior devices, but only such air as forms and accompanies said cones. Due to this fact, it is only necessary for the operator to regulate the pressure of his oil and of his air until a satisfactory combustion is produced, whereupon the desired combustion is maintained in a manner much more satisfactory and over much longer periods of time without attention than has been possible heretofore.

The admission of air through the rotator 10 can be regulated in any suitable and well known manner. For example, the inclined surfaces 19 and 21 can be conveniently fixed in the frame work while the outer member 26 may rotate and thus open or close the openings 18, all in a manner as is customarily done in what is known as air registers. In the same way, pressure of the oil in the pipe 12 may be regulated through the usual cocks not shown that accompany oil burners of this nature.

In the somewhat modified form of the invention illustrated in Figure 3, a plurality of rotators 10 is provided, and the conduit 11 is extended so as to serve all of said rotators. The furnace chamber 6 is associated with water tubular boilers, as will be readily understood.

It will now be clear that by proceeding in the manner above disclosed, one is enabled to provide a considerable volume of powdered fuel and air in the form of a rotating hollow expanding cone which fills the fuel inlet to the furnace, and which provides a uniform distribution of air to the fuel particles. One is further enabled to cause this said cone of powdered fuel to intermingle with the rotating hollow cone of finely divided oil which likewise fills the fuel inlet of the furnace and provides a uniform distribution of air among its particles. It will further be clear that by thus operating, a more uniform and even combustion is had than in those cases where such even distribution of fuel and air is not had.

It is obvious that those skilled in the art may vary the details of construction as well as the arrangement and operation of the parts without departing from the spirit of the invention, and therefore it is not desired to be limited to the above disclosure except as may be required by the claims.

What is claimed is:

1. The process of burning powdered fuel in a furnace chamber which consists in intimately mixing said fuel with air while in rotation; forming the rotating mixture into a hollow cone of a diameter sufficient to fill the fuel inlet to the furnace chamber, when it enters the latter; causing said cone to admix with a hollow cone of finely divided liquid fuel; and passing both cones into said chamber for ignition, substantially as described.

2. In an apparatus for burning powdered fuel, the combination of a source of supply of said fuel; a chamber into which said supply delivers; a source of air under pressure; means for imparting to said air a rotary motion and delivering it to said chamber to mix with and to rotate said fuel; a fuel inlet leading into a combustion chamber from said first named chamber; means to supply a cone of liquid fuel to said combustion chamber; and means adapted to cause said rotating air and fuel to assume the form of an expanding cone adapted to enter said combustion chamber through said inlet, substantially as described.

3. In an apparatus for burning powdered fuel, the combination of a chamber; means for supplying finely divided carbon to said chamber; means for supplying air in rapid rotation to said chamber and carbon, to form an intimate rotating mixture; a cone shaped means to convert said rotating mixture into a hollow cone; a combustion chamber; an exit to said combustion chamber from said first named chamber through which said cone passes; and means to supply a hollow cone of finely divided liquid fuel to be admixed with said first named cone, substantially as described.

In testimony whereof I affix my signature.

CHARLES W. DYSON.