

C. F. BAILEY & J. MORTIMER.
 AIR REGISTER FOR APPARATUS BURNING ATOMIZED FUEL.
 APPLICATION FILED MAY 22, 1912.

Patented June 30, 1914.
 2 SHEETS—SHEET 1.

1,101,723.

Fig. 1.

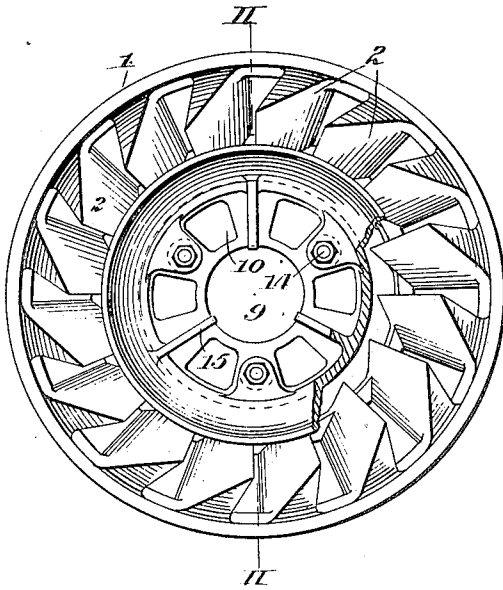


Fig. 2.

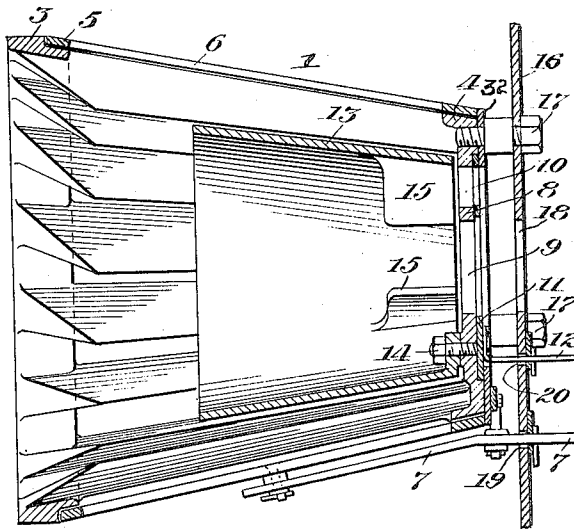


Fig. 3.

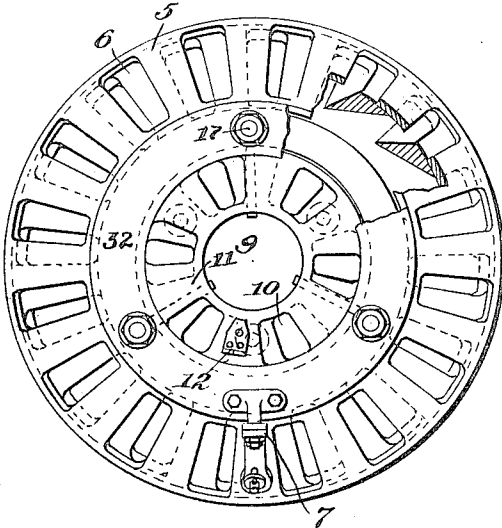


Fig. 4.

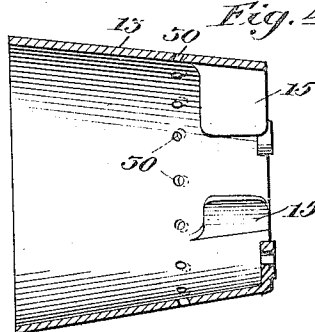
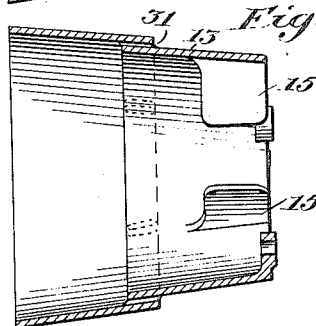


Fig. 5.



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Fig. 6.

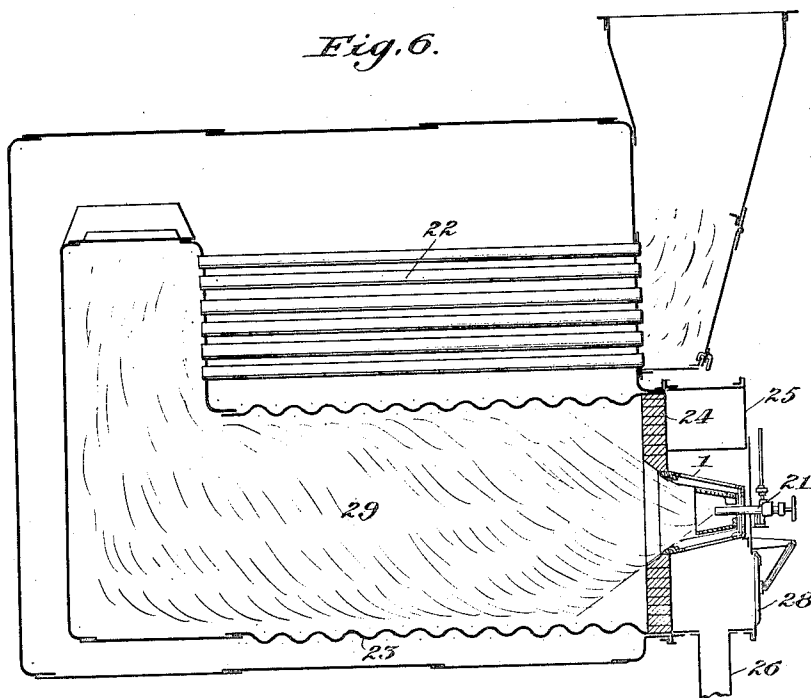
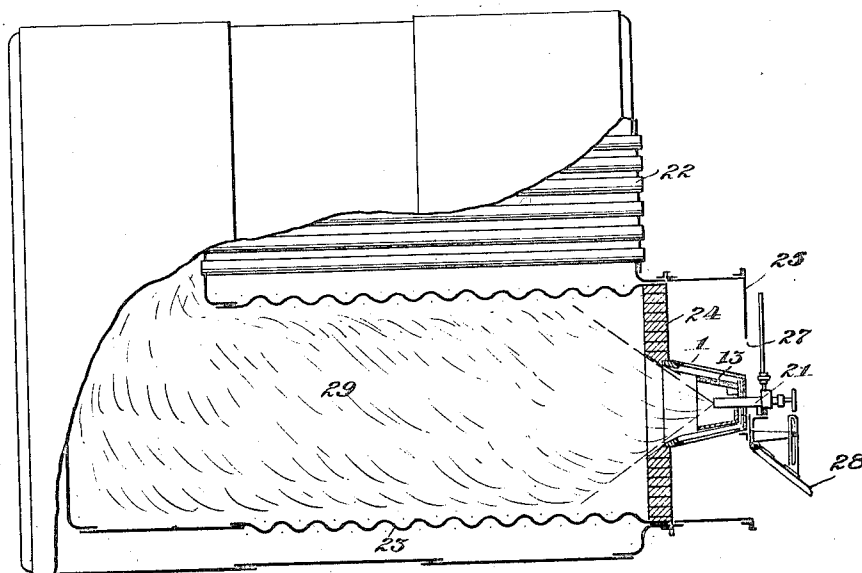


Fig. 7.



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UNITED STATES PATENT OFFICE.

CHARLES F. BAILEY, OF HAMPTON, AND JOSEPH MORTIMER, OF NEWPORT NEWS,
VIRGINIA.

AIR-REGISTER FOR APPARATUS BURNING ATOMIZED FUEL.

1,101,723.

Specification of Letters Patent.

Patented June 30, 1914.

Application filed May 22, 1912. Serial No. 699,061.

To all whom it may concern:

Be it known that we, (1) CHARLES F. BAILEY and (2) JOSEPH MORTIMER, citizens of the United States, residing at (1) Hampton and (2) Newport News, in the counties of (1) Elizabeth City and (2) Warwick, State of Virginia, have invented certain new and useful Improvements in Air-Registers for Apparatus Burning Atomized Fuel, of which the following is a specification.

This invention relates to improvements in air registers for use in conjunction with any suitable atomizers or burners for liquid or pulverized fuel.

The object of the invention is to provide an air register of simple form and construction and of durable design; which may be used with any type of sprayer or burner, but preferably with burners which spray a fluid fuel under pressure, commonly known as mechanical atomizing burners, and in any form of furnace, whether operating under natural, forced or induced draft conditions.

A large number of ways have been heretofore devised for supplying the air for combustion to the atomized or pulverized fuel as it issues from the sprayer; and it has been found by experience that the economy of operation depends largely upon the means employed for supplying this air, such means influencing and largely controlling the intensity, position and shape of the flame.

We have demonstrated by carefully-controlled experiments that the efficiency of a boiler using liquid fuel, in other words the number of pounds of water evaporated from and at 212° F., per pound of fuel, may be varied from ten per cent. to forty per cent. with air registers which, judged solely from appearances, are operating satisfactorily. In order to obtain the best evaporative results it is of course necessary that the percentage of oxygen in the stack gases should be kept as low as possible; and this requires that only sufficient air to cause complete combustion of the fuel should be supplied. If air in excess of that required for combustion is supplied, such excess air is heated, resulting in a direct waste of heat; and moreover the gases flow over the heating surfaces with an increased velocity due to their increased volume, which likewise tends to lower the efficiency. It is essential, in

order that combustion may be effected with a minimum proportion of air, that this air should be properly introduced into and mixed with the atomized fuel.

For the full understanding of the present invention, reference is made to the accompanying drawings, illustrating a preferred embodiment thereof.

In said drawings Figure 1 is an end elevation of a preferred form of air register, viewed from the rear or discharge end, the inner cone being partly broken away. Fig. 2 is a central longitudinal section of the same on line II—II of Fig. 1; Fig. 3 is an elevation of the said register, viewed from the front, the outer plate being removed, and parts being broken away; Fig. 4 represents a modified form of the truncated inner cone; Fig. 5 represents a further modified form thereof; Fig. 6 is a diagrammatic section of one type of furnace fitted with the novel air register operating under forced or induced draft conditions; and Fig. 7 is an elevation, partly in section, of a furnace fitted with the air register operating under natural draft conditions.

In said drawings, 1 represents a cage or casing, consisting essentially of a concentric series of spaced, inwardly-projecting vanes 2. These vanes preferably present surfaces inclined to the radial planes of the cage, that is, to planes passing through the longitudinal axis, and are united at their inner and outer ends by rings 3, 4, which may be cast integral with the vanes. In the form illustrated, the cage 1 is frusto-conical, flaring outwardly from the burner-seat. A sleeve 5, provided with apertures or ports 6, surrounds the cage 1 and is movable thereon by means of a rearwardly-projecting handle 7, this sleeve serving as a damper to regulate the admission of air between the vanes 2. The cage is partially closed at its front or smaller end by a fixed plate 8, which may be integral with the vanes 2, said plate 8 having a central aperture 9 for the reception of the burner, and having also an annular series of apertures 10 for the admission of air directly to the inner cone. A disk-damper 11, similarly apertured, overlies the plate 8, and may be rotated by means of its handle 12, in order to control the air-supply to said cone. A ring

32, overlying the front plate 8 serves to retain the sleeve 5 and the damper 11, while permitting movement thereof.

Within the cage 1 is a fixed inner or burner casing 13, in the form of a relatively short truncated cone or cylinder, the walls of which are preferably adjacent the inner edges of the vanes 2. This casing is shown as secured by bolts 14 to the front plate 8 of the cage 1, and may carry radial lugs 15, serving as seats for the burner. A plate 16, adapted to close the aperture in the boiler front when the register is in operative position, is secured to the cage 1 in properly spaced relation by bolts 17: this plate 16 has a central burner aperture 18 registering with the aperture 9 of the front plate 8 and is preferably slotted as indicated at 19, 20, to receive the handles 7 and 12 and to permit movement thereof to such extent as may be necessary for the regulation of the ports in the cage and front plate respectively.

Certain preferred modes of mounting the register in connection with boiler furnaces are illustrated in Figs. 6 and 7, wherein 21 represents a burner of any approved type, 22 the boiler, and 23 the boiler-furnace. The register is mounted in conjunction with the refractory furnace wall 24, and is inclosed by a sheet-metal casing 25, which may either receive the air under pressure or induced draft through the flue 26, as shown in Fig. 6 or through other flues not shown, or which may be apertured as indicated at 27, in Fig. 7, for use with natural draft conditions.

28 represents a door, mounted upon the furnace front, for closing a lower opening when desired.

The purpose and result of the arrangement of parts as above described is to secure an extremely intimate intermixture of the air and fuel with the result that combustion of the atomized fuel may be secured with the minimum proportion of air, the quantity of air admitted through the periphery of the register and likewise through the front plate thereof being subject to accurate control. The air is admitted through the peripheral ports 6 directly to the channels between the vanes 2, and when these vanes are inclined to the radial planes of the register, as in the preferred construction, there is imparted to the air so admitted an inwardly directed whirling movement which persists to a greater or less degree in the flame itself, as indicated at 29 in Figs. 6 and 7. This whirling motion imparted to the flame does away with any core in the flame that might otherwise form, and keeps the flame in contact with the furnace walls, not only on the upper half, but entirely around the periphery, thus giving more effective furnace-heating surface, and a

correspondingly higher furnace efficiency. The cage 1, and the inner casing 13, are usually frusto-conical in form as shown, but for certain purposes and applications either or both of these elements may be cylindrical; and under certain conditions, also, the vanes 2 may be disposed in radial planes. The inner casing 13 is essentially a protecting member such as a cone or cylinder, and keeps the heavy blast of air from beating down the minutely atomized fuel until combustion has started and a high temperature has been reached. This protecting member has the effect of producing combustion near the front of the furnace, thus increasing the effective heating surface of the furnace.

In certain instances it has been found desirable to alter the form of the flame issuing from the register by providing for the admission of air to the inner casing 13 through its periphery, such admission of air being supplemental to the introduction of air into the front of the inner casing through the regulated ports 10. For this purpose, we may provide in this casing one or more series of peripheral holes 30, as shown in Fig. 4; or an annular slot 31 between spaced, overlapping sections of the casing wall, as shown in Fig. 5. One or another of the described modifications may be used, as may be desirable under all conditions of the installation; or the device may be otherwise modified as desired without departure from the spirit of the invention.

We claim:—

1. In an air register for fuel burners, a cage having peripheral ports and tangential inwardly-projecting vanes, said ports located between and substantially coextensive in length with said vanes, means having longitudinal slots controlling said ports, and an inner burner-casing having walls shorter than and adjacent the inner edges of said vanes.

2. In an air register for fuel burners, a cage having peripheral ports and inwardly-projecting vanes, said ports located between and substantially coextensive in length with said vanes, said vanes disposed at an angle to the longitudinal radial planes of the cage whereby an inwardly directed whirling movement is imparted to the inflowing air, rotary peripheral means having longitudinal slots for controlling said ports, and an inner burner-casing having walls shorter than and adjacent the inner edges of said vanes.

3. In an air register for fuel burners, a cage having peripheral ports and tangential inwardly-projecting vanes, said ports located between and substantially coextensive in length with said vanes, rotary peripheral means having longitudinal slots for controlling said ports, an inner burner-casing having walls shorter than the inner edges

of said vanes and having rear ports, and means for controlling said rear ports.

4. In an air register for fuel burners, a cage having peripheral ports and tangential inwardly-projecting vanes, said ports located between and substantially coextensive in length with said vanes, rotary peripheral means having longitudinal slots for controlling said ports, an inner burner-casing having walls shorter than the inner edges of said vanes and having peripheral and rear ports, and means for controlling said rear ports.

5. In an air register for fuel burners, a cage having peripheral ports and inwardly projecting vanes, said ports located between and substantially coextensive in length with said vanes, said vanes disposed at an angle to the longitudinal radial planes of the cage whereby an inwardly directed whirling movement is imparted to the inflowing air, rotary peripheral means having longitudinal slots for controlling said ports, an inner burner-casing having walls shorter than the

inner edges of said vanes and having rear ports, and means for controlling said rear ports.

6. In an air register for fuel burners, a cage having peripheral ports and inwardly projecting vanes, said ports located between and substantially coextensive in length with said vanes, said vanes disposed at an angle to the longitudinal radial planes of the cage whereby an inwardly directed whirling movement is imparted to the inflowing air, rotary peripheral means having longitudinal slots for controlling said ports, an inner burner-casing having walls shorter than the inner edges of said vanes and having peripheral and rear ports, and means for controlling said rear ports.

In testimony whereof, we affix our signatures in presence of two witnesses.

CHARLES F. BAILEY.

JOSEPH MORTIMER.

Witnesses:

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GEO. A. PARKER.