June 24, 1924.

1,499,127

D. V. SHERBAN

APPARATUS FOR SUPPLYING PULVERIZED FUEL

Filed Nov. 22, 1921 3 Sheets-Sheet 1

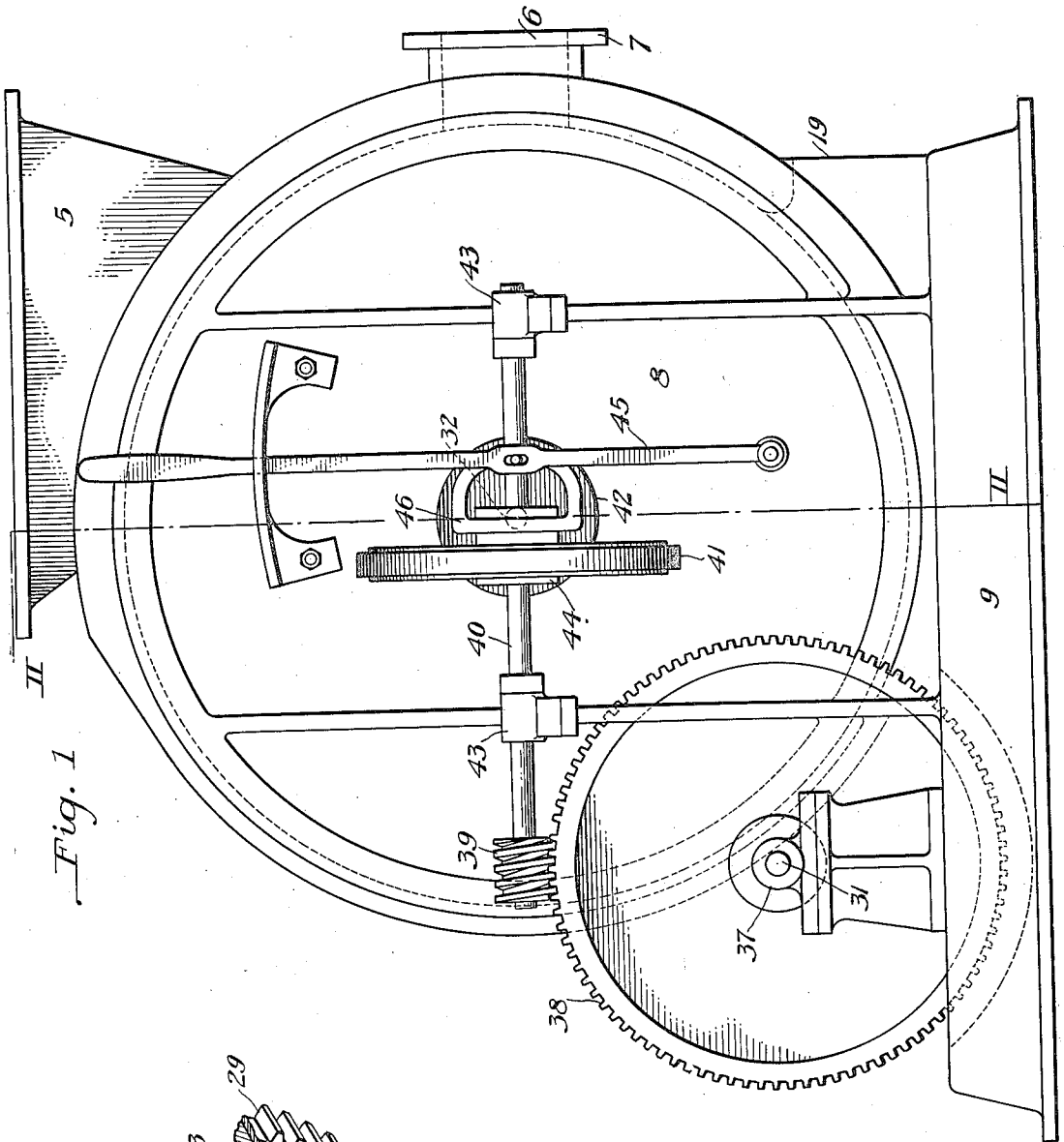



Fig. 1

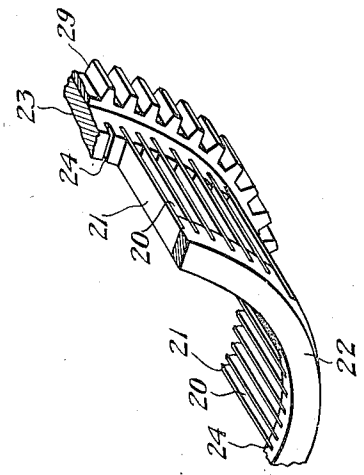



Fig. 4

INVENTOR.
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June 24, 1924.

1,499,127

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APPARATUS FOR SUPPLYING PULVERIZED FUEL

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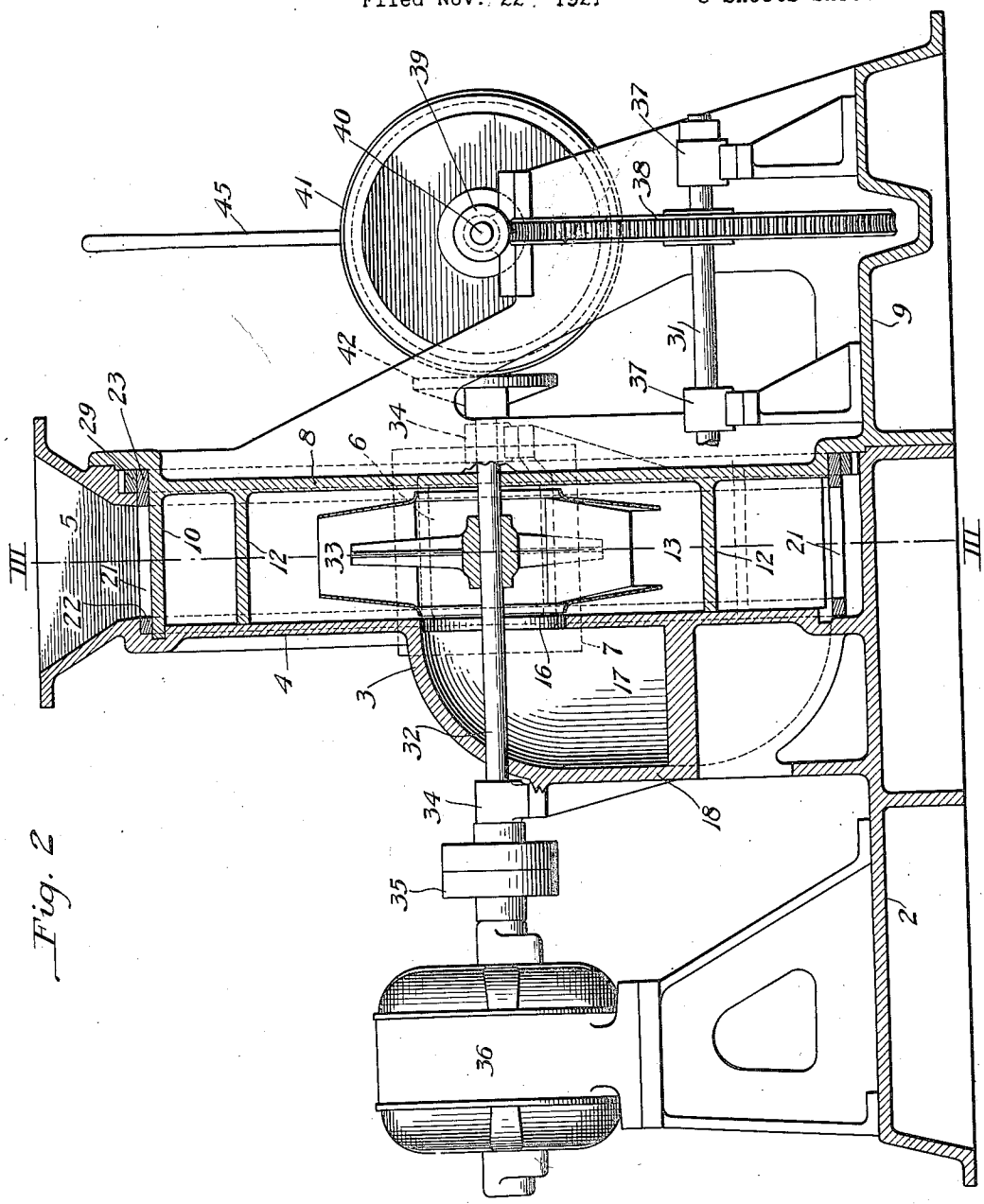



Fig. 2

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APPARATUS FOR SUPPLYING PULVERIZED FUEL

Filed Nov. 22, 1921 3 Sheets-Sheet 3

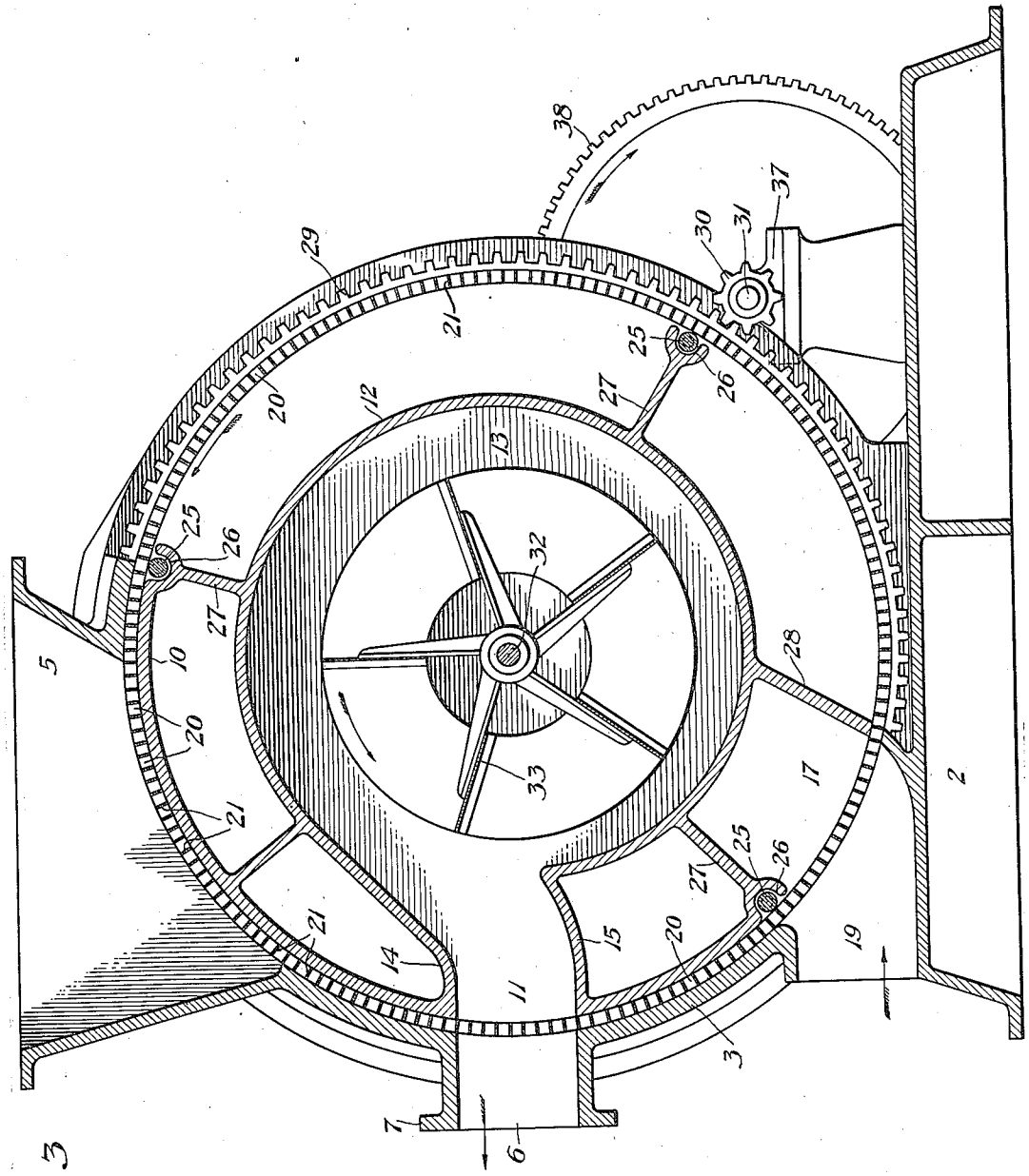



Fig. 3

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Patented June 24, 1924. 1,499,127

# UNITED STATES PATENT OFFICE.

DANIEL V. SHERBAN, OF CANTON, OHIO, ASSIGNOR TO THE BONNOT COMPANY, OF CANTON, OHIO.

## APPARATUS FOR SUPPLYING PULVERIZED FUEL.

Application filed November 22, 1921. Serial No. 517,126.

*To all whom it may concern:*

Be it known that I, DANIEL V. SHERBAN, a citizen of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Apparatus for Supplying Pulverized Fuel, of which the following is a specification.

My invention relates to an improved process and apparatus for feeding pulverized fuel to a combustion chamber. It has in view to effect a regulated flow of the fuel, preferably in the form of pulverized coal, by suspension in an impelling air current, whereby to ensure thorough admixture and proper delivery for perfect combustion. The operation provides for the segregation of unitary portions from a mass of pulverized fuel and subjecting them to the action of an induced flow of air by means of the apparatus hereinafter more fully described.

In the drawings showing such apparatus,

Fig. 1 is a view of the machine in elevation;

Fig. 2 is a transverse vertical sectional view on the line II—II of Fig. 1, showing portions of the actuating gearing in elevation;

Fig. 3 is a vertical section at right angles thereto on the line III—III of Fig. 2; and

Fig. 4 is a sectional perspective detail view showing a portion of the rotatable fuel carrier.

The machine comprises an outer casing having a supply hopper for pulverized fuel, as coal, and a discharge opening leading to a furnace; an inner casing or frame having an air supply and an air discharge conduit leading to and registering with the discharge opening; a rotary fan for inducing an air current, and a rotatable fuel carrier located between the outer and inner casings adapted to carry unitary portions of the fuel from the hopper into the path of the air current for admixture and conveyance thereby, together with actuating mechanism, as hereinafter described.

Extending upwardly from a foundation base 2 is a partly cylindrical shell or casing 3 embodying a front wall 4 and having at its top a hopper 5 formed by upwardly sloping walls, for pulverized coal. Midway of its height, casing 3 is provided with an integral outlet or supply conduit 6, rectangular in cross section, for mixed coal and air adapted for connection with a furnace chamber by flanges 7 or otherwise.

The other side of the casing is closed by a rear wall 8 extending upwardly from a supplemental base 9 spaced beyond wall 4 a distance sufficient for the intervening rotatable fuel carrier and the current inducing fan. Extending inwardly from wall 8 across such space is an outer partly cylindrical peripheral shell 10 conforming to the curvature of outer casing 3 and spaced inwardly therefrom a distance equal to the thickness of the annular fuel carrier, with sufficient clearance for easy rotating movement thereof. Shell 10, as shown, extends only from a point beyond the bottom of hopper 5 downwardly across the outlet space 11, leading to conduit 6, and to a point approximating the lower end of outer shell 3. An inner annular wall 12 extends across from rear wall 8, enclosing the fan chamber 13 between it and wall 4, and extending over by lateral portions 14, 15, to provide the outlet opening 11, registering with the delivery conduit 6, and of similar rectangular form in cross section.

The fan cavity 13 is thus provided, is of eccentric or cycloid formation for the best effect by the fan on incoming air, which enters the fan cavity through an opening 16. Said opening communicates with a lateral chamber 17 surrounded by a laterally extended casing extension 18, and chamber 17 registers with an air inlet conduit 19 opening to the atmosphere between the lower terminal of outer casing 3 and the base 2, across the intervening annular space between the inner periphery of the outer casing and the outer periphery of inner casing 10.

Rotatably mounted between the outer and inner casings 3 and 10, is the annular fuel carrier, the function of which is to carry the pulverized fuel from hopper 5 to the discharging position between conduits 11 and 6.

The fuel carrier consists of a consecutive annular series of transverse radially disposed pocket openings 20 between a corresponding series of transverse radial partitions 21, extending between supporting rings 22, 23, at each side of the cavity 13. Partitions 21, as shown, are of thin blade form, inserted by their ends in receiving slots 24 of the rings, extending radially from the axial center of the ring, and providing corresponding radially disposed spaces. The

inner and outer edge faces of the blades 21 and rings 22, 23, are preferably flush, and in order to concentrically support the ring at points beyond the embracing casings 3 and 10, I provide rollers 25 loosely mounted in housing sockets 26 in the terminals of radially extending webs or extensions 27 of the inner shell 12, and carried by terminal journals of the rollers in bearings thereof. A wall extension 28 may be provided as shown, providing with opposite web 27, the air inlet conduit 17 leading inwardly to the fan cavity.

Ring 23 at one side of the fuel carrier is provided with a ring gear 29, the teeth of which are engaged by an actuating pinion 30 of shaft 31, whereby the fuel carrier is rotated through intervening gearing from the motor driven shaft 32 of fan 33. Said shaft extends through front and back walls 4—8 and is mounted in bearings 34 of the casing, and is coupled at 35 with the armature shaft of a motor 36.

Fan 33 of any suitable construction is secured to and driven by shaft 32 within the cavity 13, and operates to induce a flow of air inwardly through openings 19—17—16 to chamber 13, and to force air therefrom outwardly through opening 11, across through the slotted openings 20 of the fuel carrier, and through conduit 6.

For the purpose of imparting rotating movement to the fuel carrier at a relatively much slower speed than that of the fan shaft 32, pinion shaft 31, mounted in bearings 37 on base 9, is geared by worm wheel 38 and worm 39 of shaft 40 through friction disks 41 and 42, with the fan shaft. Shaft 40 is mounted across the rear wall 8 in bearings 43, 43, and friction disk 41 is splined by its hub 44 on the shaft. A lever 45 is connected by fork 46 with the hub 44 and may be adjusted to any position desired, so as to locate the relative positions of the driven and driving disks to determine the desired speed, as will be readily understood.

The construction of the machine will be clear from the foregoing description.

In operation, pulverized coal or other pulverized fuel will fill the spaces 20 of the fuel carrier as it slowly rotates in the direction of the arrow, and as the carrier passes beyond the hopper between the adjacent faces of casings 3 and 10, the coal will be retained until it comes into register with the upper portions of transverse air conduit openings 11—6. Thereupon, the air current will force the unitary deposits of coal dust consecutively outwardly from each pocket, at the same time becoming thoroughly mixed therewith, and carrying the combustible mixture forward to the furnace.

Inasmuch as the coal dust is ordinarily dislodged by the air at the first moment of registering with the conduit opening, the dislodged mass of coal dust will lie at the upper portion or strata of the air column passing through the conduit. It will also be supported thereon more or less, so as to be maintained throughout its progress towards the furnace in a condition of suspension or flotation. By this means, the pulverized coal is delivered in a condition best adapted to perfect and immediate combustion, with ample air content, and a minimum of resulting smoke and ash. Should there be any remaining dust adhering to the partitions 21 of the carrier, it will be carried inwardly by the induced air current when passing around across the area of the inlet conduit 19 and propelled by the fan into the general circulation towards conduit 6, with the main supply.

I claim:

1. Means for supplying pulverized fuel consisting of a hollow cylindrical movable carrier having a series of radial straight face holding openings formed between thin radial blades for receiving and separating unitary portions from a mass and maintaining them in separated relationship, a casing providing an enclosing wall at the outside and inside respectively of said carrier having oppositely registering conduits at the outer and inner side of the carrier, and means for inducing a flow of air through both conduits and the intervening carrier whereby to remove the fuel from the carrier and carry it through one of said conduits.

2. Means for supplying pulverized fuel consisting of a hollow cylindrical movable carrier having a series of radial straight face holding openings formed between thin radial blades for receiving and separating unitary portions from a mass and maintaining them in separated relationship, a casing providing an enclosing wall at the outside and inside respectively of said carrier having an upwardly extending hopper for containing such mass at a receiving location and provided with oppositely registering conduits beyond the hopper and at the outer and inner side of the carrier, and means for inducing a flow of air through both conduits and the openings of the intervening carrier, whereby to remove fuel from the carrier and carry it through one of said conduits.

3. Apparatus for feeding pulverized fuel consisting of an annular rotatable comparatively thin hollow ring provided with an annular series of radial openings, an inner and an outer supporting and confining casing, a hopper extending upwardly from the outer casing and opening into the openings of the ring, a radial outer discharge opening in the outer casing, and

an inner air supply conduit registering therewith.

4. Apparatus for feeding pulverized fuel consisting of an annular rotatable comparatively thin hollow ring provided with an annular series of radial openings, an inner and an outer supporting and confining casing, a hopper extending upwardly from the outer casing and opening into the openings of the ring, a radial outer discharge opening in the outer casing, an inner air supply conduit registering therewith, and means for supplying an air current therethrough.

5. Apparatus for feeding pulverized fuel consisting of a casing having outer and inner annular walls with an intervening carrier space, an intervening annular rotatable perforate carrier, an outer discharge conduit, an inner conduit registering therewith at the other side of the carrier, and means for impelling air therethrough.

6. Apparatus for feeding pulverized fuel consisting of a casing having outer and inner annular walls with an intervening carrier space, an intervening annular rotatable perforate carrier, an outer discharge conduit, an inner conduit registering therewith at the other side of the carrier, and a fan adapted to force air through the inner conduit and the perforate carrier to carry fuel therefrom through the outer conduit.

7. Apparatus for feeding pulverized fuel consisting of a casing having outer and inner annular walls with an intervening carrier space, an intervening annular rotatable perforate carrier, an outer discharge conduit, an inner conduit registering therewith at the other side of the carrier, a fan within the casing arranged to force air through said conduits, and means for actuating it.

8. Apparatus for feeding pulverized fuel consisting of a casing having outer and inner annular walls with an intervening carrier space, an intervening annular rotatable perforate carrier, an outer discharge conduit, an inner conduit registering therewith at the other side of the carrier, a fan within the casing arranged to force air through said conduits, means for driving the fan, and means in operative connection with the fan driving means for actuating the fuel carrier.

9. Apparatus for feeding pulverized fuel consisting of a casing having outer and inner annular walls with an intervening carrier space, an intervening annular rotatable perforate carrier, an outer discharge conduit, an inner conduit registering therewith at the other side of the carrier, a fan within the casing arranged to force air through said conduits, means for driving the fan, and means in operative connection with the fan driving means for actuating the fuel carrier at variable speeds.

10. In combination with an outer cylindrical casing having an upper outer supply hopper, an outer outlet conduit, and an inner current producing element; a cylindrical movable radially apertured fuel carrier adapted to carry portions of fuel within the outer casing from the hopper thereof to registering position between the outer outlet conduit and the inner current producing element.

11. In combination, an outer annular casing having an upper hopper and a lateral outlet conduit, an inner annular casing having a lateral conduit registering therewith, an intervening rotatable annular radially apertured fuel carrier, a middle fan chamber, a fan therein, and an air inlet conduit leading to the fan chamber.

12. In combination, an outer annular casing having an upper hopper and a lateral outlet conduit, an inner annular casing having a lateral conduit registering therewith, an intervening rotatable annular radially apertured fuel carrier, a middle fan chamber, a fan therein, and an air inlet conduit leading inwardly through the outer casing, fuel carrier and inner casing to the fan chamber.

13. In combination with the outer and inner casings separated by the annular clearance space and an intervening annular rotatable fuel carrier; supporting rollers therefor carried by the inner casing.

14. Apparatus for feeding pulverized fuel consisting of a hollow cylindrical movable carrier consisting of a rotatable shell having a series of closely adjacent short radial uniformly open pockets extending from one side to the other separated by thin straight side walls, a bearing wall therefor at the outer and inner side of the carrier respectively, the outer of said walls having a magazine supply opening leading directly to one face of the carrier, and both of said walls having oppositely registering air current openings leading directly to opposite faces of the carrier.

In testimony whereof I hereunto affix my signature.

DANIEL V. SHERBAN.