April 3, 1934 G. B. VROOM 1,953,090

BURNER FOR LIQUID OR COMMINUTED SOLID FUELS

Filed Nov. 17, 1931

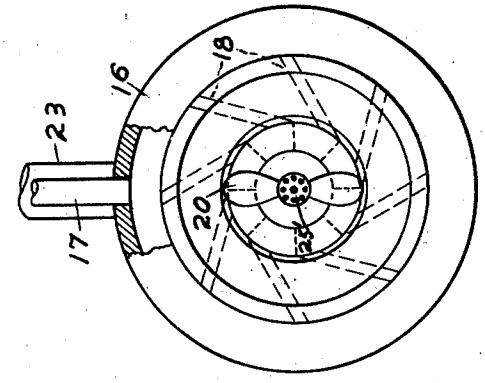


Fig. 2.

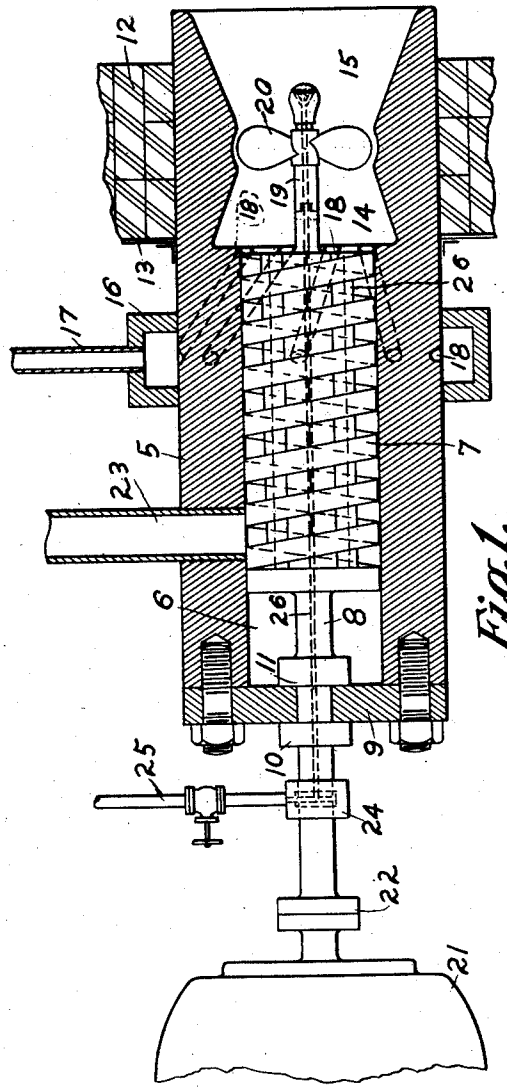


Fig. 1.

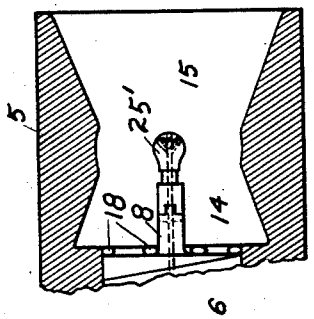


Fig. 3.

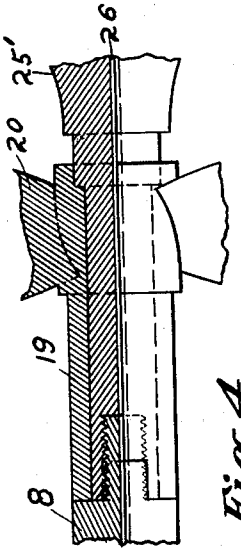


Fig. 4.

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BURNER FOR LIQUID OR COMMINUTED SOLID FUELS

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6 Claims. (Cl. 110—22)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This invention relates to a burner that is optionally usable for powdered solid fuels or for liquid fuels, or both simultaneously.

It is the object of my invention to provide a burner that is equally effective for the combustion of either of the mentioned types of fuel, or of both together in case the calorific value of the solid fuel is low or when rapid production of large quantities of steam is necessary, or either the flame from the fluid fuel burner may serve merely as a torch to insure continuous ignition of the solid fuel in case the latter is of very low quality or is discontinuously fed.

A further object is to make the construction simple and rugged, cheap to produce and easy to disassemble for inspection, replacement or repair.

With the above and other objects in view, the invention consists in the construction, combination and arrangement of parts as will be hereinafter more fully described.

Reference is to be had to the accompanying drawing forming a part of this specification in which like reference characters indicate corresponding parts throughout the several views and in which

Fig. 1 is a longitudinal sectional view of the device;

Fig. 2 is an end elevation of the burner end thereof;

Fig. 3 is a detail of the burner chamber with the device arranged for operation by a motor connected to the shaft of the feed worm;

Fig. 4 is a longitudinal sectional detail of the shaft of the device adjacent the burner end thereof.

It is desirable that boilers be equipped to burn more than one type of fuel, since at times it may be difficult or impossible to obtain one kind, or a sufficiently good grade of that kind. Under such conditions, it may be necessary to supplement or replace the solid fuel with liquid fuel, or vice versa. The present invention is designed to make possible such changes as expeditiously as emergencies may require.

The body 5 is provided with a substantially cylindrical bore 6 in which is mounted a feed worm 7 to which powdered solid fuel is delivered by feed pipe 23. The shaft 8 of the worm passes through closure 9 for the outer end of the bore with thrust collars 10 and 11 on the shaft disposed on opposite sides of the closure 9. Body 5 is shown as extending through a furnace wall comprising refractory lining 12 and shell 13.

In the inner end of body 5 is a mixing chamber 14 connected to an expanding nozzle chamber 15 through a constricted throat. Air under suitable pressure is supplied to wind-box 16 through pipe 17 and is injected through ducts 18 into the bore 6 adjacent the inner end of worm 7, tangentially to the wall of the bore, whereby powdered fuel delivered to the inner end of the worm is whirled with great turbulence into mixing chamber 14 and thence into nozzle chamber 15 where it ignites. The turbulent movement of the air and fuel insures thorough mixture thereof so that each particle of fuel is enveloped in air, thus making rapid and complete combustion possible. A stub shaft 19 connected to the inner end of shaft 8 carries a propeller 20 that is rotated by the blast of air from ducts 18 to drive worm 7. An alternative drive for the worm is motor 21 connectible to shaft 8 by a clutch 22.

Liquid fuel under pressure is supplied to internally grooved collar 24 by pipe 25, whence it passes through duct 26 in shaft 8 and stub shaft 19 to an atomizer 25′ carried on the end of the stub shaft, as shown in Fig. 1 or on the end of shaft 8 as shown in Fig. 3. The liquid fuel may be burned alone or simultaneously with the solid fuel by the construction shown in the first figure if the solid fuel alone does not develop sufficient heat, or the liquid fuel may be burned to serve only as a torch to ignite the solid fuel. Fig. 3 shows device adapted for driving worm 7 by motor 21 only.

Radially disposed fins 26 between the turns of worm 7 impart to the powdered solid fuel a rotatory motion in addition to the translational movement which aids in the picking up of the fuel by the air from ducts 18. The motion of propeller 20 increases the turbulence of the air-fuel mixture in the mixing chamber 14.

It will be understood that the above description and accompanying drawing comprehend only the general and preferred embodiment of my invention, and that various changes in construction, proportion and arrangement of parts may be made within the scope of the appended claims without sacrificing any of the advantages of my invention.

The herein described invention may be manufactured and used by or for the Government of the United States for governmental purposes without the payment to me of any royalties thereon.

Having thus described my invention, what I claim is:

1. A fuel burner comprising a body having a

longitudinal bore, a mixing chamber, a nozzle chamber, and a plurality of ducts from the exterior of said body extending tangentially to said bore and opening into said bore adjacent said mixing chamber; a shaft having a longitudinal duct therein mounted in said bore, a closure for an end of said bore through which said shaft extends, a thrust collar on said shaft on each side of said closure, a worm on said shaft, means to supply solid fuel to said worm, a stub shaft on said shaft, a propeller mounted on said stub shaft between said mixing chamber and said nozzle chamber, a burner for fluid fuel on said stub shaft operatively connected to the duct in said shaft, a wind-box enclosing the outer ends of said plurality of ducts, means to supply liquid fuel to the duct in said shaft, and a prime mover connectible to said shaft.

2. A fuel burner comprising a body having a longitudinal bore, a mixing chamber, a nozzle chamber, and a plurality of ducts from the exterior of said body extending tangentially to said bore and opening into said bore adjacent said mixing chamber; a shaft having a longitudinal duct therein operatively mounted in said bore, a worm on said shaft, means to supply solid fuel to said worm, a propeller disposed between said mixing chamber and said nozzle chamber, and operatively connected to said shaft, means to supply air to said tangentially extending ducts, means to supply liquid fuel to the duct in said shaft, and a liquid fuel burner operatively carried by said shaft and connected to the duct in said shaft.

3. A fuel burner comprising a body having a longitudinal bore, a mixing chamber, there being a plurality of ducts from the exterior of said body extending tangentially to said bore and opening into said bore adjacent said mixing chamber; a shaft rotatably mounted in said bore, a worm carried by said shaft, means to supply fuel to said worm, means to supply air to said tangentially extending ducts, and means drivable by air from said ducts to rotate said shaft.

4. A fuel burner, comprising a body having a chamber therein, means to introduce comminuted solid fuel into said chamber, means having parts in common with the aforementioned means to introduce liquid fuel into said chamber, means to introduce air into said chamber at points laterally and rearwardly of the point of introduction of the liquid fuel and to impart to said air movement having one component tangential and another component parallel to the direction of motion of the fuel before introduction into said chamber and means operable by said air to drive elements of both of said fuel introducing means.

5. A fuel burner comprising a body having a longitudinal bore, a mixing chamber, there being a plurality of ducts from the exterior of said body extending tangentially to said bore and opening into said bore adjacent said mixing chamber, a shaft rotatably mounted in said bore, said shaft having a longitudinal passage therethrough, a worm carried by said shaft, a liquid fuel dispersing device on said shaft in communication with said passage, means to supply comminuted solid fuel to said worm, means to supply liquid fuel to said passage, means to supply air under pressure to said ducts and means operable by said air to drive said worm and said liquid fuel dispersing device.

6. A fuel burner, comprising a body having a longitudinal bore, a mixing chamber, there being a plurality of ducts from the exterior of said body extending tangentially to said bore and opening into said bore adjacent said mixing chamber, a shaft rotatably mounted in said bore, said shaft having a longitudinal passage therethrough, a worm carried by said shaft, means to supply solid fuel to said worm, a liquid fuel dispersing device on said shaft in communication with said passage, means to supply air under pressure to said ducts and means operable by air from said ducts to drive said worm and said fuel dispersing device, said device being adapted to emit liquid fuel as a whirling spray substantially at right angles to the direction of forward movement of the air.

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