

No. 657,579.

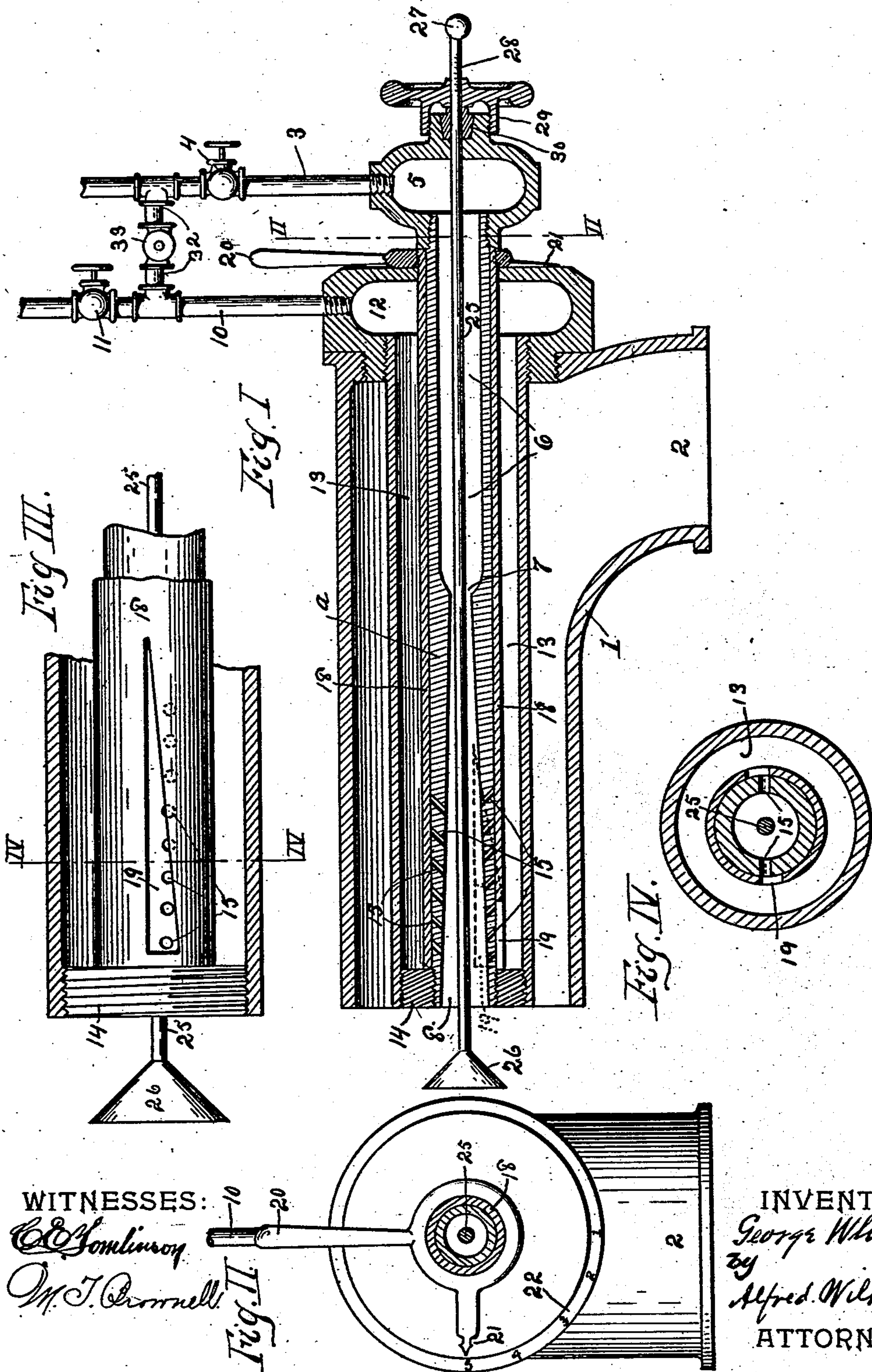
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G. WHITE.

FUEL INJECTOR AND BURNER.

(Application filed Aug. 15, 1899.)

(No Model.)



WITNESSES:

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FUEL INJECTOR AND BURNER.

SPECIFICATION forming part of Letters Patent No. 657,579, dated September 11, 1900.

Application filed August 16, 1899. Serial No. 727,324. (No model.)

To all whom it may concern:

Be it known that I, GEORGE WHITE, of Jersey City, in the county of Hudson, in the State of New Jersey, have invented new and useful
5 Improvements in Fuel Injectors and Burners, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

My invention relates to the combustion of
10 oil and coal-dust, by which a high degree of heat is obtained quickly and maintained steadily with economy of fuel; and it consists principally of an apparatus constructed and arranged to separately feed oil and coal-
15 dust into the combustion-chamber of a furnace in such a manner that the ignited oil will be directed across the path of coal-dust, instantly igniting and mechanically distributing it.

20 The invention also consists in the general construction and arrangement of the apparatus which I have designed to carry out this part of my invention.

This apparatus consists, essentially, of a
25 conduit through which coal-dust is delivered into the combustion-chamber under a high velocity by an air-blast or other suitable means, a conduit for supplying oil, a nozzle for supplying steam, the latter having a gradually-expanding exit in communication with
30 the oil-conduit, and a deflector for directing the oil across the path of coal-dust, the oil being delivered into the combustion-chamber by a blast of steam.

35 My invention will be better understood by reference to the accompanying drawings, in which the same reference characters indicate the same parts in all the figures.

Figure I is a longitudinal section of the
40 burner and supply mechanism that I have devised for putting my invention into practical operation. Fig. II is substantially a rear elevation, being a section taken on line II II of Fig. I. Fig. III is an enlarged view of a
45 portion of my mechanism, illustrating the means for controlling the oil-orifices, portions being shown in section and portions in elevation. Fig. IV is a cross-section of the preceding, taken on line IV IV.

50 In the several views the numeral 1 indicates a conduit having an opening 2, through

which coal-dust is delivered from a pulverizer or other source of supply. The conduit opens into the combustion-chamber of the furnace and is of sufficient size to supply the proper
55 amount of coal-dust and is proportioned to the capacity of the pulverizer in which the coal is to be reduced to dust.

Centrally arranged within the conduit 1 is an injector for introducing a spray of oil and
60 steam. This injector consists of a steam-nozzle and an oil-conduit, the latter being arranged concentric with the coal-dust conduit and surrounding the steam-nozzle with which it communicates. A pipe 3, provided with a
65 valve 4, supplies the steam to a chamber 5, and as the steam-nozzle communicates with said chamber it will be seen that a constant and uniform supply of steam is provided. The nozzle α is of peculiar construction, its
70 duct being of uniform diameter for a portion of its length, as shown at 6, then contracted, as shown at 7, and finally terminating in a gradually-expanding exit 8. A pipe 10, provided with a valve 11, supplies oil to the cham-
75 ber 12, which is in communication with the oil-conduit 13. The conduit 13 has its inner end closed by a plug 14 and is provided with series of inclined orifices 15 15, the purpose of which will be hereinafter explained. 80

18 is a rotatable sleeve fitted around the steam-nozzle and formed with triangular open-
ings 19 19, one for each series of orifices, two being shown, for cutting off as many of these
85 orifices as may be desired to regulate the supply of oil. The sleeve is turned by handle 20 and is provided at the rear with the indicator 21 and scale 22 for indicating the number of orifices opened and closed.

25 is a rod centrally arranged within the
90 steam-nozzle and longitudinally adjustable therein. The inner end of the rod 25 projects into the combustion-chamber and is provided with a cone-shaped head 26 for directing the oil-flame constantly and uniformly at an an-
95 gle against the encircling stream of coal-dust, thus insuring its constant ignition. The outer end of the rod 25 is provided with a handle 27 and a scale 28, said rod being adjustably supported in a screw-cap 29. A conical col-
100 lar 30 is arranged around said rod and forced in by the screw-cap acting as a stuffing-box.

The steam and oil supply pipes are connected together by a pipe 32, provided with a valve 33, so that steam may be turned into the oil-pipe to clean it and the orifices when desired.

By the peculiar construction of the steam-nozzle a considerable pressure, owing to the contracted portion 7, is maintained in the steam-chamber 5, and consequently a correspondingly-increased velocity of the steam in its passage through the gradually-expanding portion of the duct is obtained. In passing through the gradually-expanding portion of the duct the steam draws or siphons the oil, which is introduced under but slight pressure, if any, and the mingled oil and steam enter the combustion-chamber at a high velocity, but almost atmospheric pressure. As the oil ignites at a lower degree of temperature than the coal-dust it will be instantly ignited as it impacts against the deflector and the flame will be directed across the path of coal-dust, which will be instantly ignited and mechanically distributed.

By the construction of the parts a substantially straight and parallel flow both of the coal-dust and of the oil is obtained, so that both streams may be carried into the furnace a greater or less distance before deflection and ignition. This circumferential deflection brings the oil-flame and coal-dust fuels into contact with the large volume of air necessary for complete combustion, so that there is no necessity for any auxiliary means for spreading the streams. This uniform and constant deflection of the oil at a high velocity and the direction of the flame against the entering stream of coal-dust at all points insures a complete distribution of the finely-subdivided fuel and uniform and perfect combustion without danger of any deposit or clogging of the parts.

The principle of my invention lies in the use of a limited amount of oil, together with a considerable quantity of coal-dust, injected separately into the furnace and there instantly ignited. By using the oil and coal-dust together I take advantage of the characteristic features of the oil, its igniting at a low degree, and its ready, quick, and complete combustion at a high degree of temperature, by which the coal-dust is immediately raised to a red heat, generating gas which is ignited and the carbon also consumed. By this use of the oil and coal-dust together a constant steady heat at a high degree is obtained and a perfect combustion of the fuel. It is evident that the necessary amount of air must be present to promote perfect combustion, which is admitted in any usual way, as through dampers. Some air is admitted with the coal-dust, but usually not sufficient. The coal-dust may be fed in directly from the pulverizer by a draft or blast of air generated therein and the oil injected by steam, as here described, or by other equivalent means, such as compressed air.

While the best results are obtained by using my oil-burner in connection with coal-dust, as here described, yet this burner being simple and effective may be used for burning oil alone without the coal-dust.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a furnace, the combination of means for feeding coal-dust into the combustion-chamber and means for injecting a fluid fuel into said chamber, the flame of the fluid fuel being directed across the path of the coal-dust in order to ignite and mechanically distribute the body of coal-dust.

2. In a furnace, the combination of means for supplying coal-dust to the combustion-chamber, means for injecting a fluid fuel to said chamber, and means for directing the flame of the fluid fuel across the path of the coal-dust.

3. In a furnace, the combination of a conduit through which coal-dust is fed to the combustion-chamber by a blast of air, a conduit for injecting a fluid fuel, and means for directing the flame of the fluid fuel across the path of the coal-dust.

4. In a furnace, the combination of the means for supplying coal-dust to the combustion-chamber, and means for supplying a fluid fuel to said chamber under a high velocity, the flame of the fluid fuel being directed across the path of the coal-dust.

5. In a furnace, the combination of a conduit for supplying coal-dust to the combustion-chamber, a conduit for supplying a fluid fuel to said chamber, said conduits being concentrically arranged, and means for directing the flame of the fluid fuel across the path of the coal-dust.

6. In a furnace, the combination of two conduits leading to a combustion-chamber, said conduits being concentrically arranged and spaced from each other, the outer conduit supplying coal-dust and the inner conduit a fluid fuel to the combustion-chamber, and means for directing the flame of the fluid fuel across the path of the coal-dust.

7. In a furnace, the combination of two conduits leading to a combustion-chamber, said conduits being concentrically arranged and spaced from each other, the outer conduit supplying coal-dust and the inner conduit a fluid fuel, each under a high velocity, and means for directing the flame of the fluid fuel across the path of the coal-dust.

8. In a furnace, the combination of a conduit for supplying coal-dust to the combustion-chamber under a high velocity, a restrictive conduit for supplying a fluid fuel under a high velocity to said combustion-chamber, said conduits being concentrically arranged, and means for directing the flame of the fluid fuel across the path of the coal-dust.

9. In a device for separately feeding coal-dust and oil into furnaces, the combination of a conduit for supplying coal-dust to the

combustion-chamber under a high velocity,
an oil-conduit, a nozzle communicating with
the oil-conduit, means for supplying the oil
and means for directing the flame of the fluid
5 fuel across the path of the coal-dust.

10. In a device for separately feeding coal-
dust and oil into a furnace, the combination
of a conduit for supplying coal-dust to the
combustion-chamber under a high velocity,
10 an oil-conduit, a nozzle communicating with
the oil-conduit, means for supplying the oil
to the combustion-chamber under a high ve-
locity, and a deflector for directing the flame
of the fluid fuel across the path of the coal-
15 dust.

11. In a device for separately supplying oil
and coal-dust into a furnace, the combination
of the coal-dust conduit leading into the fur-
nace, means for supplying the coal-dust to
20 the combustion-chamber, an oil-conduit con-
centrically arranged within the coal-dust con-
duit, a steam-supplying nozzle communicat-
ing with the oil-conduit, said nozzle having a
contracted portion and an expanded portion,
25 whereby the fluid fuel will be injected into
the combustion-chamber at an increased ve-
locity, and means for directing the flame of
the fluid fuel across the path of the coal-dust.

12. In an injector-burner, the combination

of an oil-conduit provided with a supply-pipe, 30
and a nozzle arranged in the oil-conduit and
communicating therewith, said nozzle having
a gradually-increased portion in the direction
of its exit end and a contracted portion in the
rear of the expanded portion, the former of 35
sufficient length to cause the oil-feeding me-
dium to gradually expand, whereby the pres-
sure will be diminished and the velocity of the
medium increased, substantially as described.

13. In an injector-burner, the combination 40
of an oil-conduit provided with a supply-pipe
and a nozzle arranged in the oil-conduit and
communicating therewith, said nozzle having
a gradually-increased portion in the direction
of its exit end and a contracted portion in the 45
rear of the expanded portion, the former of
sufficient length to cause the oil-feeding me-
dium to gradually expand, whereby the pres-
sure will be diminished and the velocity of the
medium increased, with means for regulating 50
the supply of oil.

In testimony whereof I have hereunto
signed my name.

GEORGE WHITE. [L. S.]

Witnesses:

ALFRED WILKINSON,
GEO. E. KNOWLES.