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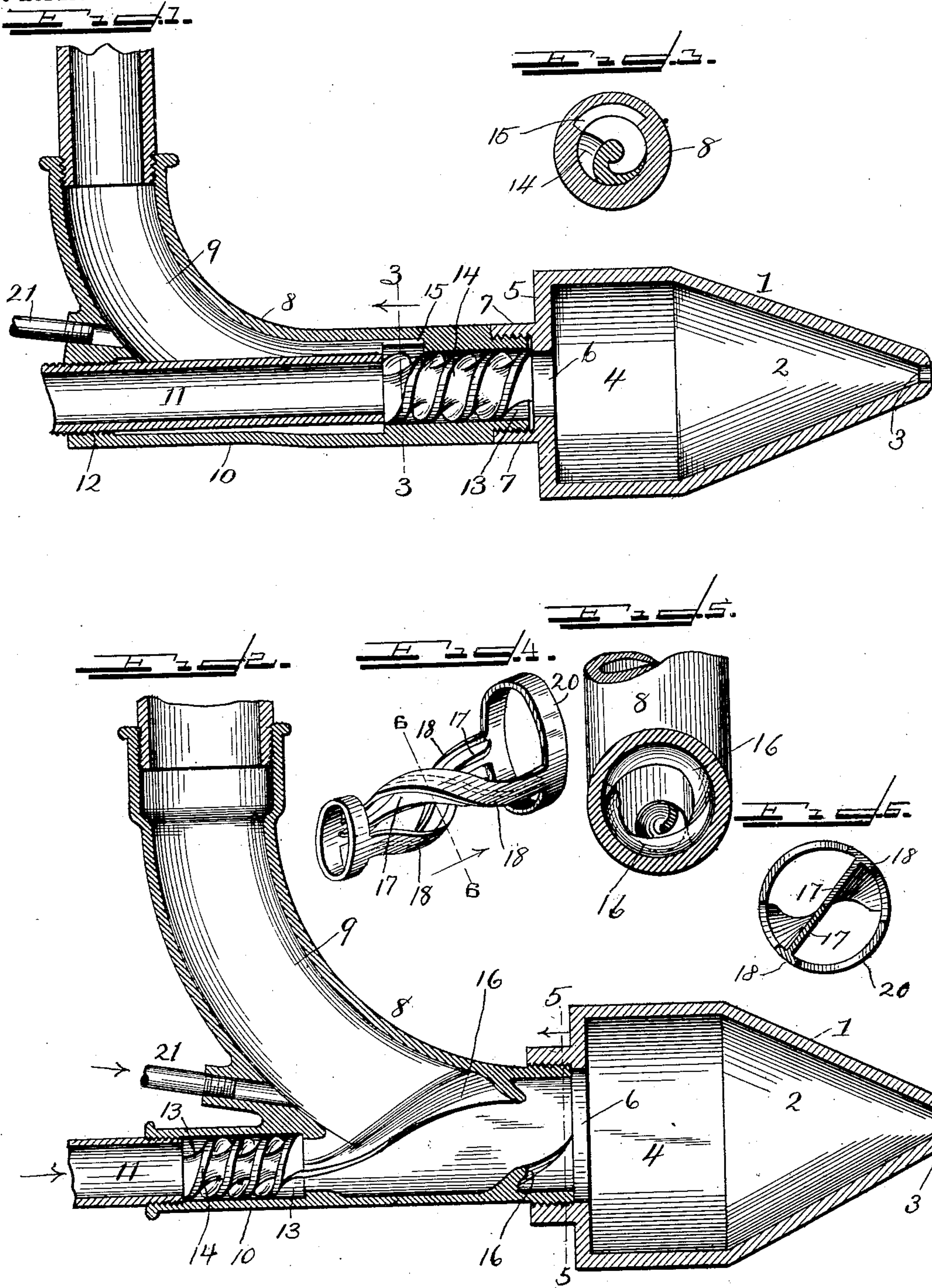
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W. W. WEAVER.

BURNER FOR LIQUID AND PULVERIZED FUEL.

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NO MODEL.



WITNESSES

Ira D. Perry
J. B. Halpern

Ten-Ten

William W. Weaver
By Elliott & Hopkins ATTY

UNITED STATES PATENT OFFICE.

WILLIAM W. WEAVER, OF CHICAGO, ILLINOIS, ASSIGNOR TO HOT BLAST SMOKELESS STOKER COMPANY, A CORPORATION OF ARIZONA TERRITORY.

BURNER FOR LIQUID AND PULVERIZED FUEL.

SPECIFICATION forming part of Letters Patent No. 738,131, dated September 1, 1903.

Application filed April 1, 1901. Renewed May 25, 1903. Serial No. 158,683. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. WEAVER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Burners for Liquid and Pulverized Fuel, of which the following is a full, clear, and exact specification.

This invention relates to improvements in burners for supplying either liquid fuel—such, for example, as oil or coal tar—or pulverized fuel, such as coal, to the fire-chambers of furnaces and any other structures into which it is desirable to inject those materials.

The prime object of this invention is to thoroughly combine and mix oil with air and particularly superheated air prior to their discharge from a burner into a furnace and to thereby provide not only for a uniformity of the feed and air, but in such proportions and in such a condition best promoting the combustion of the fuel.

A further object is to supply either a liquid or pulverized fuel combined with air to a burner in a manner preventing any back pressure thereof in the burner or passages leading thereto, while at the same time reducing the fuel to the condition best promoting its distribution in the fire-chamber when discharged from the burner for its thorough and quick ignition and combustion.

A still further object is to provide for a thorough mixing of superheated air with both a liquid and pulverized fuel by giving such a direction thereto immediately prior to their entering the burner that their further mixing in the burner is substantially promoted and immediately prior to their discharge therefrom into a fire-chamber.

With these ends in view my invention consists in certain features of novelty in the construction, combination, and arrangement of parts by which the said objects and certain other objects hereinafter appearing are attained, all as fully described with reference to the accompanying drawings, and more particularly pointed out in the claims.

In the said drawings, Figure 1 illustrates a central longitudinal sectional view of a burner with the feeding devices thereof partly

in section and partly in full lines, which are particularly adapted for liquid fuel, but may be used for pulverized fuel. Fig. 2 is a similar view of the same somewhat modified for particularly adapting the feeding devices for pulverized fuel. Fig. 3 is a transverse section taken on the line 3 3, Fig. 1. Fig. 4 is a perspective view of a modified form of the devices forming a spiral passage between the inner ends of the air-supply pipe and the burner. Fig. 5 is a transverse section taken on the line 5 5, Fig. 2, and Fig. 6 is a transverse section taken on the line 6 6, Fig. 4.

The burner or nozzle 1 has a tapering portion 2, terminating in a flaring portion at its point, in which is a slit or discharge-orifice 3, and with a rearward portion 4, forming a mixing-chamber for the fuel or air, as hereinafter described, immediately before the discharge thereof through the nozzle portion 2 and out the discharge-orifice 3.

The rear end wall 5 of the mixing-chamber 4 is provided with an inlet 6 and also with a screw-threaded flange 7, surrounding said inlet, into which is screwed a casting 8, having two branches, through one of which, 9, oil or pulverized fuel is supplied to the burner and through the other, 10, is projected an air-supply pipe 11, which is screw-threaded therein, as shown at 12, to form a tight joint, but which joint, however, may be formed by any other suitable means.

Between the inner end of the air-supply pipe 11 and the inlet to the burner is a chamber 13, in which is located a spiral device or casting 14, forming a tortuous passage for both the air and fuel fed thereto, the chamber 13 being cut away at the upper side, as shown at 15, to form a passage through which fuel from the pipe 9 is directed to the tortuous passage formed by the spiral 14. This chamber, however, may extend entirely around the spiral if preferred, though in practice it will be sufficient to feed the fuel at the top of the spiral and in the path of the air-blast through the pipe 11, as indicated in the drawings. In Fig. 2, however, instead of locating the spiral 14 next the burner I prefer when using pulverized fuel to interpose between the spiral 14 and the burner and in the pipe 9 a larger and

somewhat differing form of spiral 16 and having a less number of turns and forming a tortuous passage substantially larger than that formed by the spiral 14. The form of spiral 16 is clearly indicated in cross-section in Fig. 5 and by the longitudinal sectional view thereof shown in Fig. 2, and, as shown in the latter figure, may be cast with the pipe 8 in the form of opposing wings; but, if desired, the same character of tortuous passage may be formed by the flanges 17, (see Fig. 4,) cast upon scroll-like members 18, joined at their opposing ends by bands or rings 19 20, and by this means have the spiral formed upon the same principle as when cast with the pipe 8, but in a form removable therefrom. In Fig. 4 the flanges or wings 17, like in Fig. 2, form substantially but a single convolution—that is to say, such a convolution as has but one meeting point of its wings and this about their center of length, as indicated in Fig. 6—and the direction of these wings with reference to each other and to the inlet thereto of the fuel through the passage 9 is such that it may feed freely between these wings and be given a whirl, not only promoting the mixture of the air with the fuel, but tending to prevent any back-pressure current retarding the flow of the fuel thereto. In order, however, that under no conditions of operation there may be a back pressure against the feed of the fuel there is also provided an air-inlet pipe 21, which enters the passage 9 in a plane outside of this spiral passage 16 or 17, as may be, and also the air-inlet 11, which pipe 21 preferably has such a direction as will best impinge against and force the fuel feeding to the spiral chamber and onward to the burner. In this connection it is proper to observe that the principal distinction in the construction of the spirals 16 17 and the spiral 14 is that the former ones have no core, while the latter has a core, it being found in practice when both spirals are used that by delivering the air to the spirals 16 17 in a whirl, as is done by the spiral 14, a more thorough mixing of the air with the fuel is accomplished and at the same time the tendency toward a back pressure—that is to say, a pressure tending to force the fuel upwardly in the passage 9—is avoided.

While the burners shown in Figs. 1 and 2 are designed the one for a liquid fuel, such as oil or coal tar, &c., and the other for pulverized fuel, such as coal, their principle of operation is substantially the same and differs only in that when a liquid fuel is employed the spirals 16 and 17 are not absolutely necessary for obtaining the best results, but when feeding pulverized fuel it is found that the best results are attained by using the spiral 14 in connection with the spirals 16 and 17, as may be, and for the reasons before stated that back pressure is prevented and a more thorough mixing of the fuel with the air accrues to such use, and in this connection it is proper to add that the small air-inlet 21 when a liquid fuel is used may be dispensed with.

In operation when using a liquid fuel—such, for example, as oil or coal-tar—the liquid is conducted through the passage 9 to the spiral 14, and the moment that it enters the spiral passage it is met by a blast of superheated air through the passage 11, when, with the air, it is given a whirl by the spiral 14, and thereby the mixing of the two is promoted, while at the same time it is discharged in this whirled condition into the chamber 4 of the burner, and thereby distributed throughout said chamber in such a manner as to further mix the two together immediately prior to their being concentrated at the point of and discharged through the orifice of the burner into the fire-chamber.

When using pulverized fuel in the construction shown in Fig. 2, the moment the fuel passes into the spiral way or passage 16 or 17, as may be, it is immediately contacted with a blast of superheated air in a whirl discharging from the spiral 14, and in passing through the spiral 16 or 17 it is permitted to expand and at the same time given a further whirl and maintained in this whirling condition up to the instant of its discharge into the mixing-chamber 4, and as a result is thrown in all directions therein against its walls and in such a manner as to further mix it immediately prior to its being concentrated while passing through the chamber 2 of the burner and at the discharge-orifice thereof.

The burners shown and described not only provide for delivering both a liquid and a pulverized fuel in sheet form into a furnace and for directing it to any point and any direction therein that may be desired, but for such a thorough mixture of the fuel with hot air as to supply the fuel to the fire-chamber of a furnace in the best possible condition for instantaneous and perfect combustion, while at the same time the device as a whole is not only very simple and cheap of construction, but by its form and arrangement may be combined with any ordinary and commonly-used furnace or fire-chamber without any changes in the construction thereof, and as has heretofore been required by all burners for similar purposes production of any substantial commercial advantage.

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

1. A device for delivering liquid or pulverized fuel to the fire-chamber of a furnace comprising in combination a burner, a fuel-supply pipe and an air-supply pipe therefor, a mixing-chamber between said pipes and the burner and a spiral plug in one of said pipes, and an air-inlet in the fuel-supply pipe, substantially as described.

2. A device for delivering liquid or pulverized fuel to the fire-chamber of a furnace comprising in combination a burner, a fuel-supply pipe and an air-supply pipe therefor, a mixing-chamber between said pipes and burner, a spiral plug in one of said pipes, and

spiral wings in the other pipe between said plug and the mixing-chamber, substantially as described.

5 3. A device for delivering liquid and pulverized fuel to the fire-chamber of a furnace comprising in combination a burner, a fuel-supply pipe and an air-supply pipe therefor, a mixing-chamber between said pipes and

burner, a spiral plug in one of said pipes, and an air-inlet and spiral wings in the other pipe, substantially as described.

WILLIAM W. WEAVER.

Witnesses:

EDNA B. JOHNSON,
F. A. HOPKINS.