June 19, 1923. 1,459,295

T. F. SMITH

BURNER

Filed March 24, 1922 2 Sheets-Sheet 1

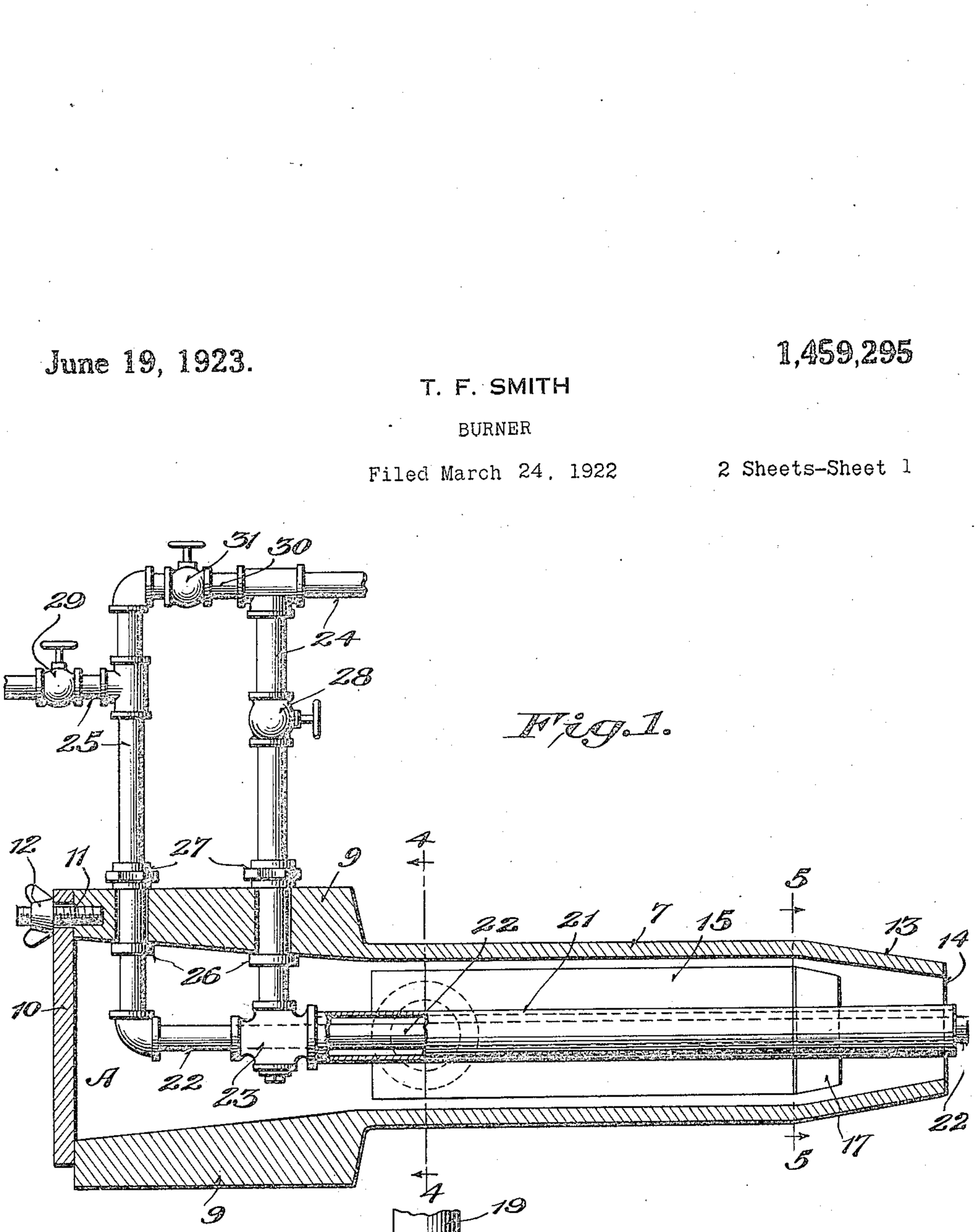

Fig. 1.

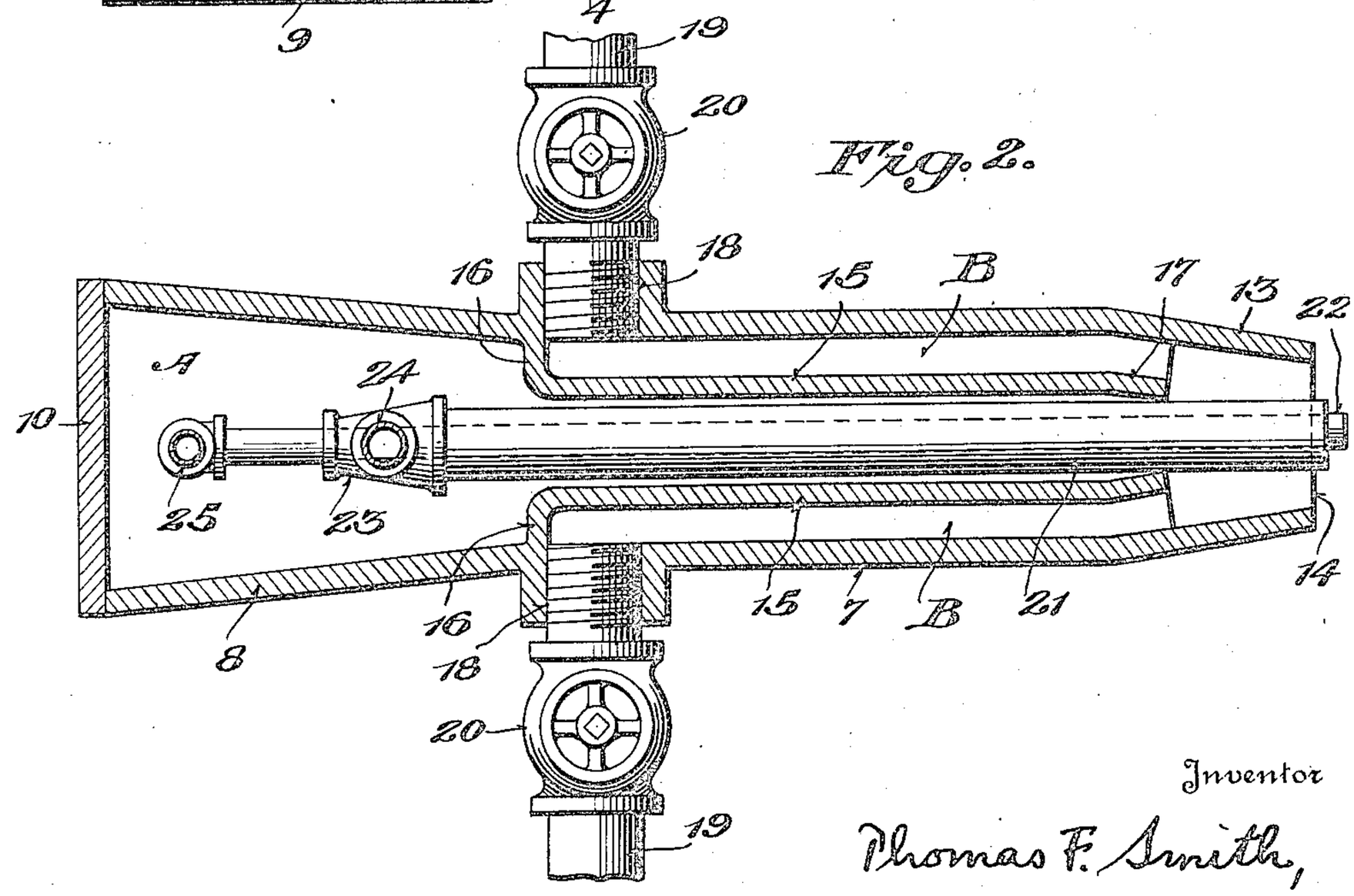

Fig. 2.

Witness:-
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Fig. 3.

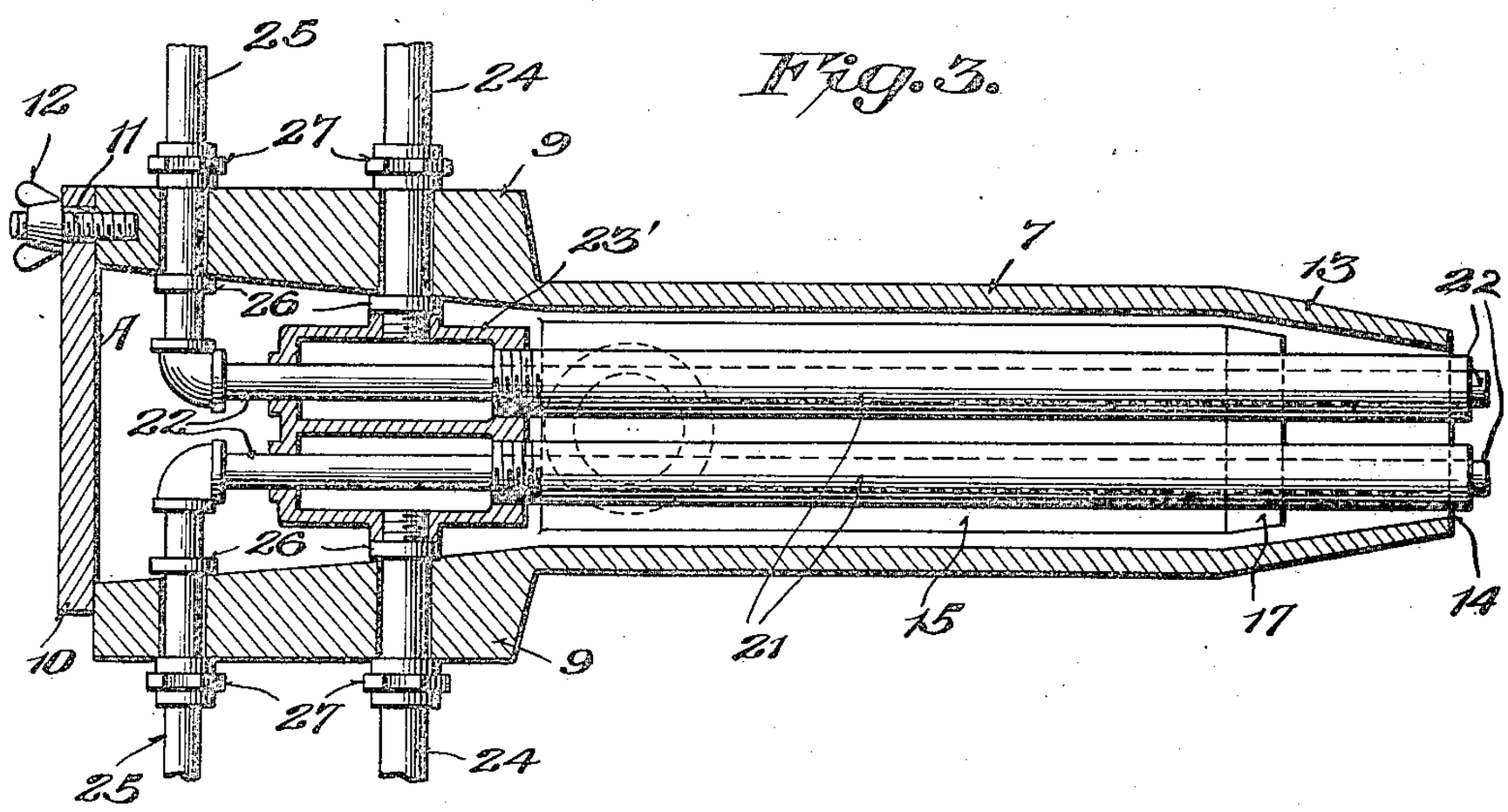


Fig. 4.

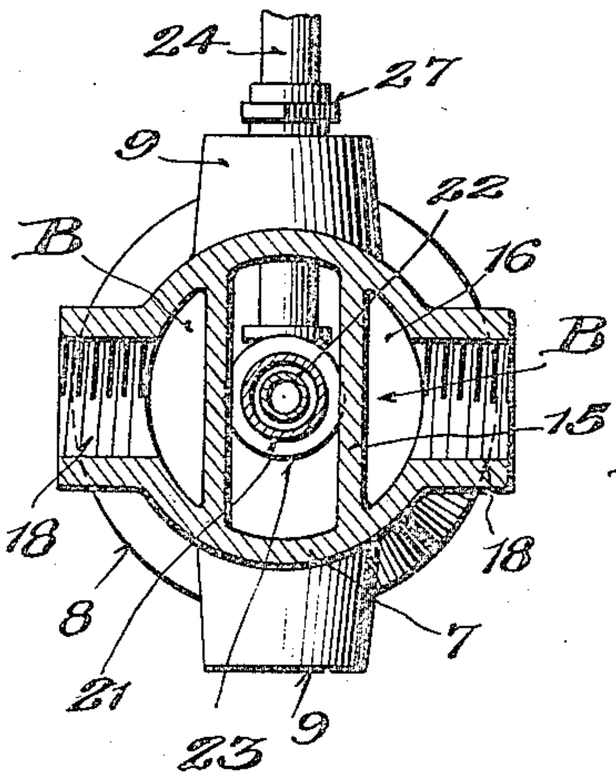


Fig. 5.

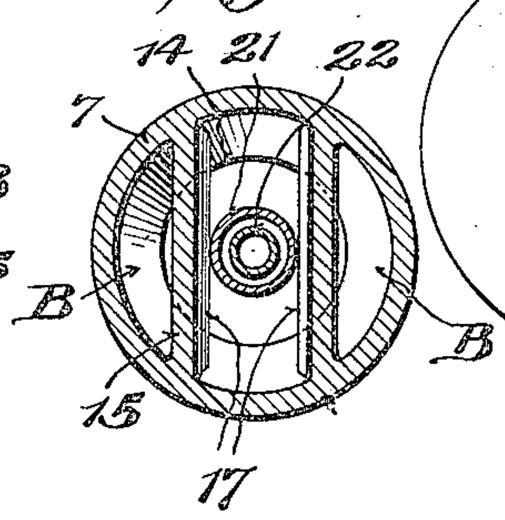
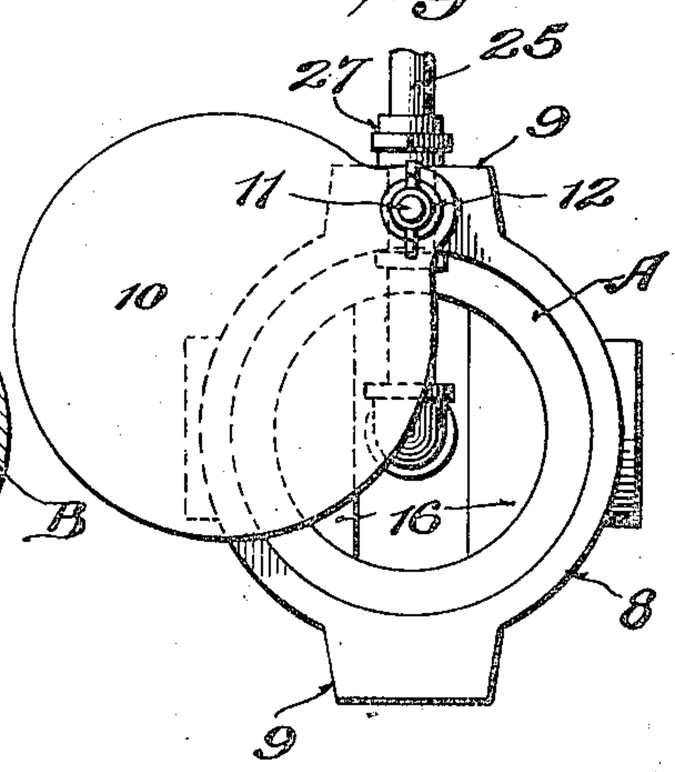


Fig. 6.



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WITNESS:-

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Patented June 19, 1923. 1,459,295

UNITED STATES PATENT OFFICE.

THOMAS F. SMITH, OF TULSA, OKLAHOMA.

BURNER.

Application filed March 24, 1922. Serial No. 546,483.

To all whom it may concern:

Be it known that I, THOMAS F. SMITH, a citizen of the United States, residing at Tulsa, in the county of Tulsa and State of Oklahoma, have invented certain new and useful Improvements in Burners, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to devices for use in the combustion of fuel in a fluent state in a furnace or other place where heat is desired.

It pertains particularly to a burner through which both liquid and gaseous fuels and an atomizing and propellant fluid under pressure, such as steam, may be passed and discharged into a fire-box or other place of combustion.

It is an object of the invention so to arrange the parts that the burner may be employed with liquid and gaseous fuel simultaneously or with either of such fuels alone.

Another object of the invention is to locate the parts in such manner that complete mixture of liquid fuel with the propellant fluid is effected, so that drip of fuel from the discharge end of the burner is avoided.

Another object of the invention is to produce a burner through which a regulated flow of air therethrough is induced for the purpose of supplying the fuel with air in the quantities required for its most efficient combustion.

When considered in connection with the description herein, the characteristics of the invention will be apparent from the accompanying drawings, forming part hereof, wherein embodiments of the invention are disclosed, for purposes of illustration.

Although the disclosures herein exemplify what now are considered to be preferable embodiments of the invention, it is to be understood that it is not the intention to be limited necessarily thereto in interpretation of the claims, as modifications and adaptations within the limits of the claims can be made without departing from the nature of the invention.

Like reference-characters refer to corresponding parts in the views of the drawings, of which—

Fig. 1 is a longitudinal vertical section;

Fig. 2 is a longitudinal horizontal section;

Fig. 3 is a fragmentary horizontal section illustrative of multiple steam and oil supply;

Fig. 4 is a section on the line 4—4, Fig. 2;

Fig. 5 is a section on the line 5—5, Fig. 3; and

Fig. 6 is a rear elevation.

The burner is arranged to be installed in the front wall or equivalent part of a boiler or other furnace, in a manner common to the art.

It includes an elongated casing 7, which is generally cylindrical and of uniform dimension in its intermediate portion.

In the outer or receiving-end portion, the wall of the casing flares outwardly, as shown at 8, to afford a somewhat enlarged chamber A for accommodation of supply-pipes and their appurtenances and to provide space for passage of air into and through the burner. The wall portion 8 has exterior oppositely-disposed extensions 9, through which the supply-pipes extend. Air flow is controlled by a gate 10 at the outer end of the burner, which is swingable on a threaded member 11 and is held in adjusted position by a nut 12 on that member.

In the nozzle or discharge-end portion, the wall of the casing converges, as shown at 13, to the end of the burner, in order to afford a somewhat contracted discharge-opening 14.

In its intermediate or body portion, the burner contains oppositely-disposed gas-chambers B. Each of these chambers is inclosed by the casing-wall and by an inner wall joined to and preferably cast integrally with the casing-wall. A main portion 15 of each inner wall extends longitudinally of the burner and has secant disposition with respect to the casing-wall. An end portion 16 of each inner wall extends outwardly from the outer end of the main portion thereof and joins the casing wall at the inner end of the chamber A. Each inner wall extends somewhat into and terminates in the contracted nozzle portion of the burner, and it is deflected inwardly, as shown at 17, to disposition substantially parallel with the converging portion of the casing-wall. Each chamber B has a port 18 opening thereto at or near its outer end. The ports are screw-threaded and have supply-pipes 19 connected therein, and flow in the pipes is controlled by valves 20.

For the purpose of conveying steam or other propellant fluid, one or more tubes or

tubular members 21, such as pipes, are disposed in the burner and extend from the chamber A, between the inner walls and through the nozzle portion, to a place slightly outside of the discharge end. A tube or tubular member 22, such as a pipe, for conveying oil or other liquid fuel, extends through each member 21 and terminates slightly beyond the discharge end thereof.

The number of sets of tubes 21 and 22 employed in a burner depends upon its size and the particular demands it is to meet. In burners of comparatively small size, one set, as shown by Figs. 1 and 2, is sufficient; in larger burners, two sets may be employed, as shown by Fig. 3, and in some cases more than two sets may be used.

Where one set of tubular members is used, as shown by Figs. 1 and 2, the outer tube 21 is joined in the chamber A to a T-coupling 23, into which leads from the side wall of the chamber a supply-pipe 24, and the inner tube 22 extends through that coupling and is connected with a supply-pipe 25 extending from the side wall of the chamber. The tubular members are held in place in the burner by the supply-pipes, which are disposed in the strengthening extensions 9. They are secured in place by interior flanges 26 thereon abutting the wall of the chamber A and by couplings or elbows 27 abutting the outer sides of the extensions.

When two sets of tubular members 21 and 22 are installed in a burner, the supply-pipes preferably extend into the chamber A from diametrically-opposite sides and are connected with somewhat elongated T-couplings or casings 23′, as shown by Fig. 3.

The propellant-fluid supply-pipe 24 and the fuel-supply pipe 25 outside of the burner are controlled by valves 28 and 29, respectively. The supply-pipes 24 and 25 are connected by a by-pass 30 controlled by a valve 31 so arranged that, when the valves 28 and 29 are closed and the valve 31 is open, steam or other propellant fluid under pressure may be blown through the fuel-tube 22 and that tube cleaned.

When the burner is in use, liquid fuel passing through the tube 22 is heated by the surrounding steam in the outer tube 21, and both fluids are discharged slightly beyond the nozzle end of the burner. As the fuel-tube extends slightly beyond the steam-tube, liquid fuel from the former tube becomes mixed with the expanding steam outside of the burner. It has been found in practice that a more thorough mixing of the fuel and propellant fluids occurs when the fuel is discharged in this manner slightly beyond the point of discharge and that there is less liability of unmixed fuel dripping from the nozzle than where discharge of the two fluids occurs at the same place or inside of the nozzle.

Combustible gas is discharged from the chambers B inside of the nozzle, and the converging wall of the latter causes the gas to converge into and become mingled and properly mixed with the stream of fluids projected from the tubes 21 and 22. Flow of air for combustion is induced through and from the burner from the chamber A through the space between the chambers B, and the air becomes mixed with the combustible gas in the nozzle, where the converging wall directs the gas into the air stream.

The burner is arranged to use liquid fuel and a propellant and atomizing fluid alone, or with those fluids and combustible gas. Thus the burner may be employed to meet varying conditions of service. For example, oil and steam can be employed when a boiler with which the burner is associated is being operated under comparatively light load; and, when the load increases, combustible gas, and thus more fuel, may be supplied to the burner. Control of the amount and character of fuels is had by operation of the valves in the supply-pipes. Moreover, a burner such as provided by this invention may be of smaller size or used in less number with a boiler of a given range of requirements than in the case of a burner arranged to utilize one fuel alone.

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

1. A burner comprising an elongated casing having a nozzle portion with a converging wall and a chamber in its opposite end portion and containing oppositely-disposed gas-chambers having supply-ports and arranged to discharge into the nozzle portion, a tube extending from said end chamber through the space between said gas-chambers to and arranged to discharge at the nozzle end of the burner, another tube extending from said chamber through and to the discharge end of said first-mentioned tube, and means whereby propellant fluid and fuel are supplied to said tubes.

2. A burner comprising an elongated casing having a nozzle portion with a converging wall and a chamber in its opposite end portion and containing oppositely-disposed gas-chambers having supply-ports and arranged to discharge into the nozzle portion, a tube extending from said end chamber through the space between said gas-chambers to and arranged to discharge at the nozzle end of the burner, another tube extending from said end chamber through said first-mentioned tube and projecting slightly beyond the discharge end thereof, and means whereby propellant fluid and fuel are supplied to said tubes.

3. A burner comprising an elongated casing having a nozzle portion with a converg-

ing wall and a chamber in its opposite end portion and containing oppositely-disposed gas-chambers having supply ports and arranged to discharge into the nozzle portion, a coupling in said end chamber, a supply-pipe connected with said coupling, a propellant-fluid tube connected with said coupling extending through said burner between said gas-chambers and arranged to discharge at the nozzle end of the burner, a fuel-tube extending through said coupling and said propellant-fluid tube to the discharge end of the latter, and a supply-pipe connected with said fuel-tube.

4. A burner comprising an elongated casing having a nozzle portion with a converging wall and a chamber in its opposite end portion and containing oppositely-disposed gas-chambers having supply-ports and arranged to discharge into the nozzle portion, a coupling in said end chamber, a supply-pipe connected with said coupling, a propellant-fluid tube connected with said coupling extending therefrom between said gas-chambers and arranged to discharge at the nozzle end of the burner, a fuel-tube extending through said coupling and said propellant-fluid tube to the discharge end of the latter, and a supply-pipe connected with said fuel-tube, said supply-pipe being secured firmly in the wall of said end-chamber and constituting supports for said tubes.

In testimony whereof I affix my signature.

THOMAS F. SMITH.