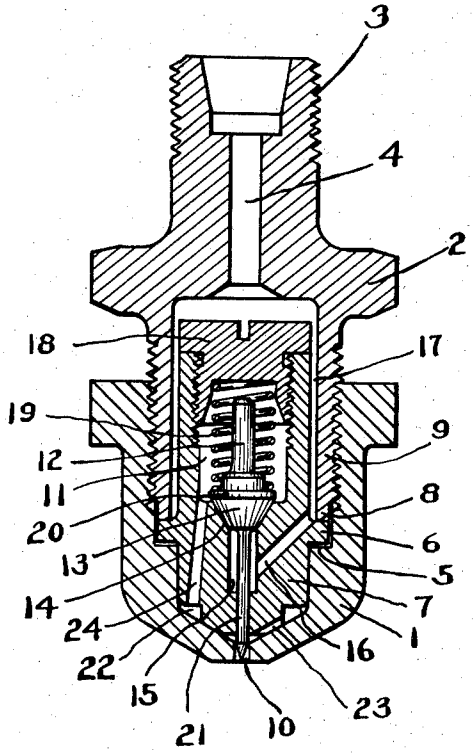
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NOZZLE FOR GAS TURBINES

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NOZZLE FOR GAS TURBINES

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1

This invention relates to nozzles and has particular reference to a nozzle for gas turbines or the like and which is capable of operation over a wide range of fuel flow pressures and quantities.

An object of the present invention is to provide a new and improved nozzle for burners such as gas turbines wherein the fuel flow controls the opening of the nozzle valve and also the operation orifice area and wherein the supply of fuel to the burner will be satisfactorily controlled over a wide fuel flow range.

Another object of the invention is to provide a nozzle of the type set forth which is relatively simple and economical in construction yet efficient in operation.

Another object of the invention is to provide a nozzle of the type set forth wherein satisfactory fuel atomization will be provided from a fuel range of from low fuel flow for idling of the engine to maximum flow of the nozzle.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawing. It will be understood that many changes may be made in the details of construction and arrangement of parts, as the preferred form of the invention has been shown by way of illustration only.

Referring more particularly to the drawing, the nozzle shown embodying the invention comprises the nozzle cap 1 and nozzle body holder 2 having the threaded portion 3 for securing the body holder 2 to the fuel supply line not shown. The holder body 2 also has the fuel supply opening 4 adapted to supply fuel to the interior of the nozzle.

The nozzle cap 1 has the peripheral flange 5 on which is positioned the peripheral flange 6 on the nozzle body 7 and said flange 6 is retained on the flange 5 by the engagement thereon of the lower end portion 8 of the hollow nut portion 9 of the nozzle body holder 2 and which is in threaded engagement with a corresponding threaded portion on the nozzle cap 1.

The nozzle cap 1 has the orifice 10 through which fuel is adapted to be sprayed to the combustion chamber of the burner as hereinafter described.

The nozzle body 4 has the central opening off the fuel chamber 11 adapted to receive the valve 12 which has the valve portion 13 normally engaging a seat 14 in the nozzle body 7 and below which seat is the fuel chamber 15 adapted to receive fuel through the supply groove 16 which, in turn, receives fuel through the peripheral

2

space 17 between the outer surface of the nozzle body 7 and the inner surface of the hollow portion 9 on the holder body.

The threaded plug 18 is adapted to be threaded into the upper end of the hollow portion of the nozzle body 7 and to retain the coil spring 19 on the stem of the valve 12. Said spring 19 has one end in engagement with the inner surface of said plug 18 and its other end in engagement with the spring seat 20 on the valve 12 and surrounds the stem thereof. The valve has the needle projection 21 which extends through the chamber 15 and is then in relatively close fit with the nozzle body 7 and the lower end of said needle 21 is adapted to normally close the spray orifice 10.

The lower surface of the nozzle body 7 is provided with the peripheral supply groove 22 which is connected by a plurality of slots 23 to thereby supply fuel to the orifice 10. The slots 23 may be of any suitable number and may be so arranged as to provide turbulence to the fuel.

In operation fuel enters the nozzle body 2 through the pipe line connected to the threaded connection 3 and then through the passageway 4 to the space between the members 9 and 17 from which it passes through the passageway 16 to the chamber 15. The pressure of such fuel then raises said valve 13 from its seat 14 against the action of the spring 19 whereupon said fuel passes into the chamber 11 and then through the passageway 24 to the peripheral groove 22 from which it passes through the slots 23 to the orifice 10 from which it is sprayed into the burner or combustion chamber. The pressure of the fuel against the valve 13 which raises said valve from its seat 14 also lifts the needle 21 allowing the passage of fuel through the orifice 10.

It will be noted that with the present construction the pressure of fuel supplied the nozzle controls the amount of movement of the valve 13 from its seat 14 and also of the needle 21 out of the orifice 10 and, therefore, by controlling such fuel pressure it is possible to control the quantity of fuel supplied the combustion chamber. It will also be noted that with this construction fuel will be atomized into the combustion chamber over a relatively wide range of fuel flow extending from the amount of fuel necessary to idle the turbine or even below such idling speed in certain instances to maximum flow of the nozzle. In some instances such fuel flow range may vary by a ratio of 70 to 1.

It will also be understood that by controlling the pressure of the spring 19, the amount of pres-

sure required to lift the valve 13 from its seat 14 may be controlled whereby it is possible to control the pressure necessary to lift the valve and to start delivery of fuel to the turbine.

From the foregoing it will be seen that I have provided simple, efficient and economical means for obtaining all of the objects and advantages of the invention.

Having described my invention, I claim:

1. In a device of the character described, a nozzle body holder having a fuel inlet line and having a hollow portion adapted to receive a nozzle body and having a threaded portion, a cap adapted to retain said nozzle body in said body holder and having a threaded portion adapted to engage the threaded portion on said nozzle body holder, a nozzle body unit in said hollow portion in said nozzle body holder adapted to be inserted or removed as a unit, a fuel chamber in said nozzle body, a fuel outlet and valve seat in said nozzle body and a fuel outlet in said cap, said fuel outlets being aligned, and a valve in said nozzle body adapted to engage said valve seat and to be opened by fuel pressure and having an integral needle portion adapted to control the passage of fuel through said fuel outlet in said cap, a spring in said fuel chamber normally retaining said valve on its seat and a second fuel chamber in said nozzle body on the side of said valve seat opposite said spring and communicating with said fuel inlet line in said nozzle body holder whereby pressure of fuel from said fuel inlet line will open said valve against the force of said spring and retain said valve in open position until the force of said spring is greater than the pressure of fuel in said second fuel chamber said nozzle body having an adjustable member whereby the spring may be adjusted to vary the opening pressure of the nozzle.

2. In a device of the character described, a nozzle body holder having a fuel inlet line and

having a hollow portion adapted to receive a nozzle body and having a threaded portion, a cap adapted to retain said nozzle body in said body holder and having a threaded portion adapted to engage the threaded portion on said nozzle body holder, a nozzle body unit in said hollow portion in said nozzle body holder adapted to be inserted or removed as a unit, a fuel chamber in said nozzle body, a fuel outlet and valve seat in said nozzle body and a fuel outlet in said cap, said fuel outlets being aligned, and a valve in said nozzle body adapted to engage said valve seat and to be opened by fuel pressure and having an integral needle portion adapted to control the passage of fuel through said fuel outlet in said cap, a spring in said fuel chamber normally retaining said valve on its seat and a second fuel chamber in said nozzle body on the side of said valve seat opposite said spring and communicating with said fuel inlet line in said nozzle body holder whereby pressure of fuel from said fuel inlet line will open said valve against the force of said spring and retain said valve in open position until the force of said spring is greater than the pressure of fuel in said second fuel chamber and an adjustable cap secured to said nozzle body whereby pressure of said spring may be adjusted to vary the opening pressure of the nozzle.

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