

UNITED STATES PATENT OFFICE

2,379,161

BURNER

Leo J. Krapf, Long Beach, Calif.

Application December 28, 1942, Serial No. 470,324

2 Claims. (Cl. 299-120)

This invention relates to fluid fuel burners and relates more particularly to burners intended primarily for the handling of oil. A general object of this invention is to provide a practical, effective dual range or dual action oil burner.

Oil burners designed for the mechanical atomization of the fuel are widely used and some burners of this type are intended to operate throughout a wide range of fuel consumption. A common defect of such burners is their inability to operate at very low capacities. In actual practice low capacity operation is often necessary. For example, when all the burners in a furnace are required to be kept in service under "banked" conditions or light load. The inability of the prior burners to operate effectively under such conditions of necessity limits their application or use.

Another object of this invention is to provide a fluid fuel burner effective in producing mechanical atomization of the fuel which is characterized by an improved construction and arrangement of parts effective for very low capacity operation as well as operation throughout a wide range of higher fuel capacity.

Another object of this invention is to provide a burner of the character referred to in which there is a novel and effective arrangement and combination of parts embodying an auxiliary or low range tip, within the high range tip of the burner, fed from a line independent of the high capacity or main burner tip and capable of use independently of and in conjunction with the main burner tip.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of the invention, throughout which description reference is made to the accompanying drawing, in which:

Fig. 1 is a longitudinal, detailed sectional view of the burner and Figs. 2 and 3 are fragmentary, transverse detailed sectional views taken as indicated by lines 2-2 and 3-3, respectively, on Fig. 1.

The fuel burner provided by the present invention may be said to comprise, generally, a barrel 10, a main or high capacity burner tip means 11 on the barrel, and an auxiliary or low capacity burner tip means 12 in the high capacity burner tip means.

The barrel 10 forms a support for the high capacity tip means 11 and may serve as a conduit for the fuel, steam, air or other fluid to be supplied to the high capacity tip means. The barrel 10 may be in the form of an elongate tube or pipe and may be suitably mounted at the boiler, furnace, or the like. The longitudinal fluid opening 13 of the barrel 10 extends forwardly to the outer end of the barrel to carry

the fluid to the high capacity tip means. The outer end portion of the barrel 10 is reduced in external diameter and is threaded to form a stem 14. The extreme outer end of the barrel 13 has a bevelled or pitched annular seat 15 at its inner corner. A cap 16 is threaded on the stem 14 to secure or retain the burner tip assemblies on the barrel. The cap 16 has an internal annular flange 17 in its outer end presenting a bevelled or pitched inner face.

The high capacity burner tip means 11 comprises a plug or body 18 arranged in the outer portion of the barrel 10 and the cap 16. The body 18 is concentrically disposed in the outer portion of the barrel opening 13 and has a head 19 that is received in the cap 16 with suitable clearance. A pitched seating face 20 on the head 19 conforms to and bears on the seat 15 of the barrel 10. The outer end of the body head 19 is spaced well within the cap 16 and is flat and normal to the longitudinal axis of the assembly. The body 18 is spaced from the wall of the fluid opening 13 in the barrel 10 leaving an annular fluid passage 21. Spaced axial openings 22 continue outwardly through the head 18 from the passage 21 and are parts of a system of ports for carrying fuel and other fluid to the outlet of the high capacity tip means 11. A central longitudinal socket 23 is provided in the outer end of the head 19 to receive elements of the low capacity burner tip means 12, as will be later described.

The high capacity tip means 11 further includes what I will term the main tip or outer tip 24. The outer tip 24 is arranged within the outer portion of the cap 16 and has a bevelled external annular surface 25 engaged by the pitched inner face of the cap flange 17. The inner end of the main or outer tip 24 is in spaced parallel relation to the outer end of the body 18. A central whirling chamber 26 is formed in the inner end of the main tip 24. The chamber 26 is cylindrical at its inner end and has a conical or pitched wall that converges outwardly toward the discharge orifice 27 of the main tip. The outer end of the main tip 24 may have a flaring socket 28 joining the orifice 27. The orifice 27 is preferably in concentric relation with the longitudinal axis of the assembly. An annular fluid groove 29 is provided in the inner end of the main tip 24 to receive fluid from the axial openings 22, as will be later described. A plurality of circumferentially spaced ports 30 extend from the groove 29 to the whirling chamber 26. The ports 30 are tangential with respect to the cylindrical wall of the chamber 26 so that the fluid discharged from them imparts a whirling or circular motion to the fluid in the chamber 26 to assist in the atomization of the fluid under pressure.

The auxiliary or low capacity tip means 12 is a feature of the invention. The means 12 includes a plate or disc 32 interposed between the body 18 and tip 24. With the dual tip assembly arranged in position so that the surface 15 bears on the seat 20 the cap 16 is threaded on the stem 14 so that the main tip 24 is clamped against the disc 32 and the disc in turn is clamped against the outer end of the body 18. Thus the cap 16 serves to retain the entire assembly. An annular groove 33 is provided in the inner side of the disc 32 and connects the spaced ports or openings 22. Axial openings 34 extend outwardly from the groove 33 to communicate with the groove 29. This completes the port system for supplying fluid to the whirling chamber 26 of the high capacity tip.

A central opening 35 is provided in the disc 32 and a low capacity burner tip 36 is threaded through the opening. The inner portion of the tip 36 is enlarged to fit the socket 23. The tip 36 has a reduced or tapering outer portion projecting forwardly through the whirling chamber 26. A longitudinal opening 37 extends forwardly through the low capacity tip 36. The major portion of the opening 37 has walls which taper or converge forwardly to an orifice 38 which discharges at the forward end of the tip 36. As illustrated, it is preferred to have the orifice 38 disposed within the high capacity orifice 37. The forward end portion of the tip 36 is received in the orifice 27 with substantial clearance leaving an ample annular passage for the discharge of the fluid through the high capacity orifice 27. The inner end of the opening 37 in the low capacity tip 36 is closed by a plug 39.

The means for supplying the fuel or other fluid to the auxiliary or low capacity burner tip means 12 includes a conduit or pipe 40 extending forwardly through the opening 13 in the barrel 10. The pipe 40 is received in the opening 13 with substantial clearance leaving an ample annular passage for the fluid which is delivered to the main or high capacity tip means 11. The forward end of the pipe 40 is threaded in an opening 41 in the body 18. The opening 41 continues forwardly to join the socket 23. Circumferentially spaced grooves 42 are provided in the side wall of the socket 23 and extend forwardly to an annular external groove 43 in the tip 36. Ports 44 extend inwardly from the groove 43 to the whirling chamber 37 of the auxiliary tip 36. The ports 44 are preferably substantially tangential with respect to the wall of the whirling chamber 37 so that the fluid issuing from them imparts a circular or whirling motion to the fluid in the chamber. It will be seen that fluid supplied to the pipe 40 passes forwardly through the opening 41 and the socket 23 and then flows through the grooves 42 to the ports 44 to discharge into the whirling chamber 37.

It is believed that the operation of the dual range burner will be readily understood. For high or substantial capacity operation fuel under pressure is supplied to the opening 13 and passes forwardly through the passage 21, the openings 22, the groove 33, the openings 34, and the groove 29 to discharge through the ports 30 into the whirling chamber 26. The rapidly whirling fuel discharges from the chamber 26 through the main orifice 27. During such high or substantial capacity operation it may be de-

sired to supply fuel, air, steam or other fluid to the auxiliary tip 36 to increase the capacity of the burner or to assist in the heating, atomization or combustion of the fuel being discharged from the main orifice 27. The fluid for the auxiliary tip means 12 passes forwardly through the pipe 40, the opening 41 and the socket 23 and then flows through the grooves 42 to the ports 44. The fluid issuing from the ports 44 imparts a whirling motion to the fluid in the chamber 37 and this whirling fluid under pressure discharges from the orifice 38.

For low capacity operation of the burner fuel is delivered to the pipe 40 under a selected pressure to be discharged from the orifice 38 of the low capacity tip means 12 for atomization and combustion. During such low capacity operation it is unnecessary to supply fuel to the main tip means 11. If desired, however, air, steam, or other fluid under pressure may be supplied to the opening 13 to be discharged from the main orifice 27 to assist in the heating, atomization and combustion of the fuel being discharged from the orifice 38 of the low capacity tip means.

It is to be observed that the auxiliary or low capacity tip means 12 constitutes a simple, compact unit that may be readily assembled or embodied in a conventional burner. The inclusion of the low capacity tip means requires but little alteration in the general structure of the burner.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted by the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art or fall within the scope of the following claims:

Having described my invention, I claim:

1. A burner for use on a tubular barrel including a body to be engaged on the end of the barrel, the body having a socket in its outer end, a main tip spaced outwardly from the body having means forming a whirl chamber and an orifice concentric with the socket, a disc engaged between the inner side of the main tip and the outer side of the body and having a central opening concentric with the socket, and a secondary tip secured in said opening and extending rearwardly into and fitting said socket and extending forwardly into said chamber.

2. A burner for use on a tubular barrel including a body to be engaged on a seat at the forward end of the barrel, the body having a socket in its outer end having longitudinal side channels, a main tip spaced outwardly from the body having means forming a whirl chamber and a central discharge orifice, a disc engaged between the inner side of the main tip and the outer side of the body and having a central opening, a nut threaded on the barrel and clamping the main tip inwardly against the disc, a secondary tip secured in said opening to extend rearwardly into and fitting the socket and extending forwardly into said chamber, the secondary tip having means forming a whirl chamber, a discharge orifice, and tangential ports receiving fluid from the channels and discharging it into its whirl chamber, and a pipe extending forward into the barrel to supply fluid to the socket.

LEO J. KRAPS.