June 13, 1939. S. H. LÓPEZ 2,161,785

ATOMIZING BURNER FOR CRUDE PETROLEUM

Filed July 19, 1938 2 Sheets-Sheet 1

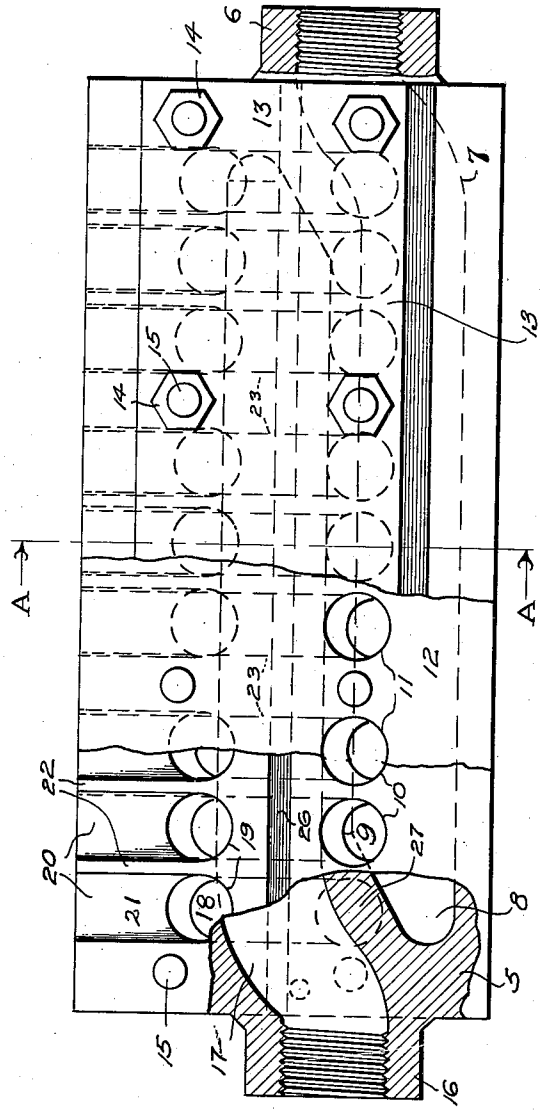


Fig. 1.

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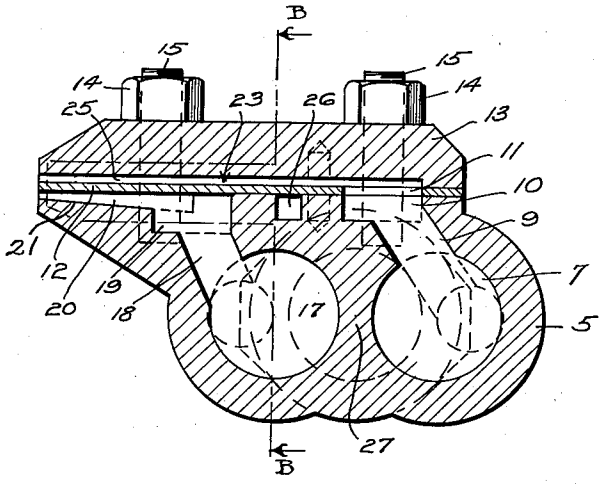


FIG. 2.

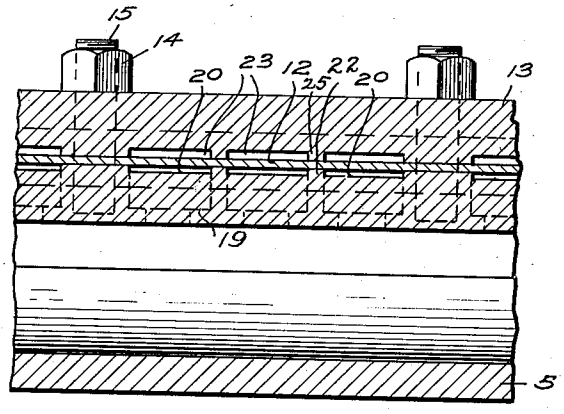


FIG. 3.

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UNITED STATES PATENT OFFICE

2,161,785

ATOMIZING BURNER FOR CRUDE PETROLEUM

Salvador Herrejón López, Mexico, D. F., Mexico

Application July 19, 1938, Serial No. 220,065
In Mexico September 29, 1937

11 Claims. (Cl. 299—141)

The object of the present invention is to provide an improved burner for crude petroleum or like fuel oils in which atomization by steam is effected. By virtue of the novel construction employed and hereinafter described, I provide a burner which fulfills several of the fundamental requirements of the technique of combustion, through which the calorific efficiency of the burner is so improved as to bring about a substantial saving, not only in petroleum consumption but in the expense incidental to the up-keep of the burner, to wit, freedom from warping and ease with which the burner may be cleaned when required. Further, the burner is so constructed as to be very simple in form and consequently to offer very low cost of manufacture.

Further objects and advantages of the invention will be set forth in the detailed description which now follows:

In the accompanying drawings

Fig. 1 is a view partly in plan and partly in section of the burner of the invention with the top plate broken away through a portion of the length of the burner; with both the top plate and division plate broken away through an additional length of the burner and with the top plate in place throughout the remainder of the length of the burner.

Fig. 2 is a transverse vertical sectional view upon line A—A of Fig. 1, and

Fig. 3 is a longitudinal sectional view upon line B—B of Fig. 2.

Like numerals designate corresponding parts throughout the several figures of the drawings.

Referring now to the drawings, 5 designates a base casting having an internally threaded boss 6 at one end for the reception of an oil supply line, not shown. An oil supply conduit 7 has a dead end 8. A series of oil ports 9 arranged in a longitudinal row lead through the casting 5 to pockets 10, the tops of which register with openings 11 formed in a relatively thin division plate 12. A cap plate 13 clamps the plate 11 between itself and the upper face of the base 5 when nuts 14 are tightened upon the studs 15. Said studs are carried by the base. From that end of the casting 5 opposite to the point of entry of the oil there extends an internally threaded boss 16 to which a line for supplying atomizing fluid may be attached. The fluid employed is preferably steam and from the boss 16 the steam enters a longitudinally extending conduit 17. Ports 18 cannect this conduit with pockets 19 formed in a longitudinal row in the upper face of the casting 5. Each pocket 19 is associated with a discharge port or nozzle 20 and the several discharge ports are constricted toward their outer ends or mouths, vertically (by the inclination of the material of the casting 5, which forms the floor of said ports). The pockets 19 which are enlarged beyond the diameters of the ports 18 form expansion and cushioning chambers which aid in maintaining an even and uniform flow of the steam through the ports or nozzles 20. At the same time the banking up of this reserve supply of steam in the pockets at the large end of a port which is constricted toward its mouth results in providing a structure which renders it possible to discharge the steam at such high velocity as may be required but at the same time with complete uniformity of flow. That is to say the flow is not in the least spasmodic but, upon the contrary, continues evenly and steadily under all fire-box conditions. This uniformity of flow of the atomizing fluid is of great importance in attaining the highest efficiency because when the burner has been once set to give the proper results for the particular furnace for which it is being used it may be depended upon to continue that action indefinitely. This not only gives the highest possible yield of heat units from the fuel but insures against smokey and dirty burners which require frequent cleaning not only of their own parts but of the furnace walls and boiler flues. The ribs 22 upon the upper face of the base which separate the several ports 20 from each other are machined off to provide a snug setting for the plate 12 and thus said plate, despite the fact that it is made relatively thing, as it must be to bring the steam and oil discharge orifices close together is efficiently supported and held against buckling and warping throughout its area. The pockets 10 communicate with oil discharge ports or nozzles 23. These ports do not taper vertically after the manner of ports 20 but may be of substantially uniform height throughout their length. The oil ports 23 align with and overlie the steam ports 20 and said oil ports are separated from each other by ribs 25 which bind upon the top face of the plate 12. A longitudinally extending port 26 is formed in the upper face of the casting 5 and it extends from end to end of said casting so that its opposite ends are open to the atmosphere and its top is formed by the plate 12. This port serves to intercept, trap and discharge at the ends of the burner any steam leakage which might otherwise find its way from pockets 19 to pockets 10. It will be seen that this burner provides a structure delivering a wide, flat flame and that this wide, flat flame is sup-

ported by streams of steam and oil, each of said streams being delivered from a multiplicity of ports, all of which ports lead from a common supply conduit. That is to say, all of the steam ports lead from conduit 17 and all of the oil ports lead from conduit 7. It will further be seen that these conduits 7 and 17 extend at right angles to the direction of discharge of the nozzles; or, in other words, they extend substantially throughout the length of the burner casting 5. Thus, with the burner disposed in the fire-box and with the relatively heavy casting 5 becoming highly heated by the flame in the fire-box the oil in it will be pre-heated and the steam will be super-heated. It will further be noted that the steam conduit is disposed toward the front side of the burner so that it will receive the greatest heat to bring about its effective super-heating. Further, it should be noted that the conduits 7 and 17 are separated from each other only by the wall 27 and thus the oil receives a certain amount of heat transfer from the steam and this brings about a greater relative correspondence between the oil and steam, as to temperature conditions throughout the whole row of ports than would be the case if it were attempted to heat the oil wholly by some other source. Actual tests of this burner have shown it to be of the highest efficiency. I am aware of the face that other burners have been proposed in which both steam and oil are discharged from associated ports. However, the present arrangement differs very radically from the burners heretofore proposed in the many respects hereinbefore described, namely, the disposition of the conduits 7 and 17 to extend lengthwise of the burner, the taking of the oil and steam supplies therefrom at points throughout their length, the inter-position of the cushioning pockets 10 and 19, the tapering of the ports 20 and the provision of the port 26. All of these features co-act to the single end of getting more useable heat units out of the fuel oil than has ever heretofore been done by anyone else. It will be noted that the feeding of the petroleum is upward from duct 7 in an ascending plane and that it is delivered above and falls by gravity on the streams of steam which atomize it and mix it with air in the fire-box. Because the petroleum outlet ducts are located directly above the steam ducts the heating of the petroleum is maintained right up to the moment of discharge, thus facilitating perfect atomization and with it a better mixing with the air. This assures perfect carburetion and correspondingly good combustion, Most fuel oils contain some low boiling point compounds. These tend to evaporate and form gas bubbles which in most burners give a great deal of trouble by interfering with the even flow of the oil. The uniform condition of the oil brought about by feeding it first into the relatively large duct 7, carrying it off in a constantly ascending plane to ports 9 and interposing the expansion chambers or pockets 10, enables me to deliver the petroleum to the steam stream with greater uniformity and less interruption by evaporated products than in any other burner with which I am familiar. It is apparent that the burner may be made of any desired length to give as many nozzles as may be required, while still requiring only one steam and one oil connection to the large capacity ducts 7 and 17. While I have shown the burner as being of straight line formation, it should be understood that its shape may be varied to fit the fire-box within which it is employed. For example, in a round fire-box it might be desired to make the burner of annular formation. This would in no way detract from the advantage of having the ducts 7 and 17 extending in the general direction of the length of the burner, whatever that may be, and with the discharging steam and oil ports leading substantially at right angles to that point in the duct from which they depart.

I therefore wish it to be understood that the invention is not limited to the precise construction set forth, but that it includes within its purview whatever changes fairly come within either the terms or the spirit of the appended claims.

Having described my invention, what I claim is:

1. A burner of the character described comprising an elongated base having a pair of conduits leading longitudinally therethrough in substantial parallelism, one for fuel oil and the other for steam, a cap plate and a division plate, each substantially co-extensive with the base, means for binding the division plate and cap upon the base with the plate between the cap and base, the upper face of the base being provided with a longitudinally extending row of steam nozzle forming channels the tops of which are closed by said division plate and which channels extend laterally to a side of the bases, there being steam ports leading from said channels to the steam conduit, said cap likewise having a series of laterally extending oil nozzle forming channels formed in its under face, the bottoms of which are closed by the division plate, there being an individual oil port leading from the oil conduit through the division plate of each of said oil nozzle channels, said oil and steam conduits lying close enough to each other to effect a pre-heating of the oil by the steam in the steam conduit.

2. A structure as recited in claim 1 wherein the upper face of the base is provided with a longitudinally extending channel which extends throughout the length of the base so that it is open at both of its ends, said channel lying intermediate the steam and oil ports.

3. A burner of the character described comprising an elongated base having a pair of conduits leading longitudinally therethrough, one for fuel oil and the other for steam, said conduits lying in substantial parallelism and side by side and close enough together to effect a preheating of the oil by the steam in the steam conduits, a cap plate and a division plate, each substantially co-extensive with the base, means for binding the cap and base together, the upper face of the base being provided with a longitudinally extending row of nozzle forming channels the tops of which are closed by said division plate and which channels extend laterally to and discharge at a side of the base so that the direction of discharge of the oil and steam is perpendicular to the length of said pair of conduits, there being steam ports leading from said channels to the steam conduit, said cap likewise having a series of laterally extending nozzle forming channels formed in its under face, the bottoms of which are closed by the division plate, there being oil ports leading from the oil conduit through the division plate to said channels, the upper face of the base being provided with a longitudinally extending channel lying intermediate the oil and steam ports the top of which is covered by the division plate, said channel being open to the atmosphere, the discharge channels formed in the upper face of the base having their bottoms up-

wardly inclined toward their outer ends, so that the resultant discharge ports formed by said channels taper toward their outer ends, as and for the purposes set forth.

4. A device of the character described comprising a base having a pair of longitudinally extending conduits therein, the respective conduits opening at opposite ends of the base and being threaded for the reception of oil and steam lines respectively, said conduits having dead inner end walls, there being a series of ports leading from the steam conduit to a corresponding number of pockets formed in the upper face of the base, there being laterally extending nozzle forming channels formed in the base and leading from said pockets to a side edge of the base, the bottoms of said channels tapering upwardly from said pockets to their discharge mouths, said channels being separated from each other by up-standing ribs, the tops of which constitute a part of the top of the base, a division plate fitted upon and covering the base and constituting the top of the ports formed by the channels of the base, a cap plate and means for binding the cap plate forcibly upon the division plate and base, there being a series of laterally extending channels formed in the under face of the cap plate of materially less depth than the channels of the base and there being ports formed in the base and through the plate and connecting the oil conduit with the nozzle forming channels of the cap plate.

5. A structure as recited in claim 1 in combination with pockets disposed between the oil nozzles and the oil supply conduit.

6. A structure as recited in claim 1 in combination with pockets formed between the steam nozzles and the steam supply conduit.

7. A structure as recited in claim 1 in combination with an intercepting port formed in the upper face of the base and lying between the steam discharge ports and the oil discharge ports, such intercepting port being open to the atmosphere.

8. In combination, a burner comprising a base, a cap and an interposed, relatively thin division plate between the base and cap, said base, cap and plate being of much greater length than width, a pair of conduits, one for oil and the other for steam, formed in and extending substantially throughout the full length of the base, a row of relatively shallow steam nozzles extending crosswise of the base and formed by grooves located in the upper face of the base and separated by upstanding ribs upon which said division plate rests, said nozzles discharging along a long side of the burner substantially throughout the full length thereof, a corresponding row of oil nozzles consisting of grooves formed in the under face of the cap and separated by ribs which bear upon the said division plate and lie in opposition to the ribs between the steam nozzles, whereby the steam nozzles are brought into paired relation to the oil nozzles in heat exchange proximity through the relatively thin division plate, and an individual oil and steam port leading from the oil and steam conduits to each of the oil and steam nozzles respectively, said conduits being of much greater cross sectional area than said ports, whereby said conduits are caused to function as oil and steam reservoirs in which oil and steam are maintained in heat exchange relation as the oil and steam are fed to the respective nozzles.

9. A burner of the character described comprising a base of much greater length than width, a cap and a division member between the base and cap, means forming an elongated row of oil nozzle passages between the division member and cap, which oil nozzle passages extend laterally of the burner and discharge along a long side of said burner, means forming an elongated row of steam nozzle passages between the base and the division member, said steam nozzle passages extending laterally of the burner and discharging along the same side of the burner at which the oil nozzles discharge, an oil conduit and a steam conduit lying side by side in heat exchange relation in the base and extending lengthwise of the base throughout the major portion of the length of said base, an individual oil port connecting each of the oil nozzle passages with the oil conduit in the base, and an individual steam port connecting each of the steam nozzle passages with the steam conduit in the base.

10. A structure as recited in claim 9, wherein the said individual ports are of much smaller cross sectional area than the conduits from which they lead.

11. A structure as recited in claim 9, wherein the steam conduit is disposed toward that side of the burner from which the steam and oil nozzles discharge.

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