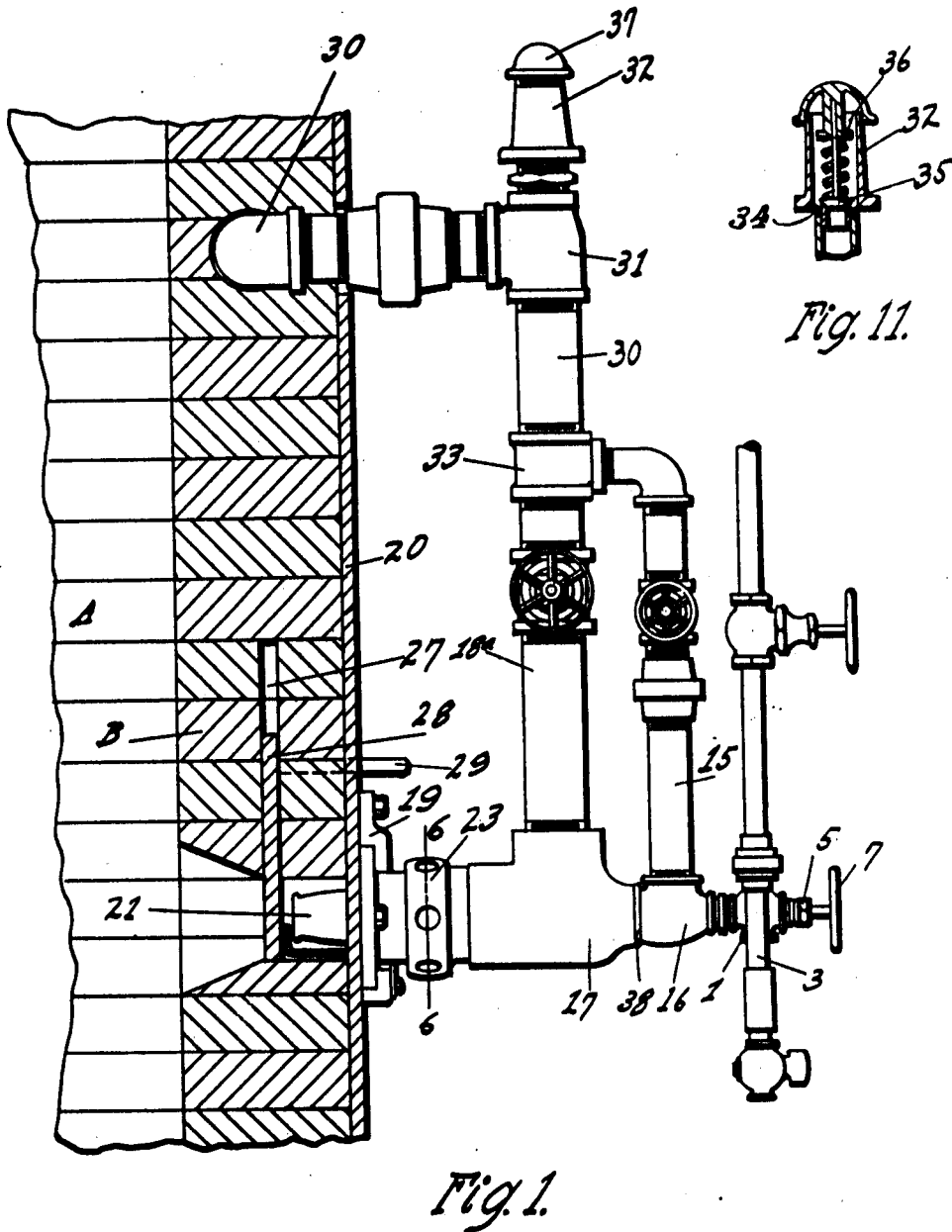


F. J. NICE.
HYDROCARBON BURNER.
APPLICATION FILED JUNE 10, 1912.

1,061,627.

Patented May 13, 1913.

3 SHEETS—SHEET 1.



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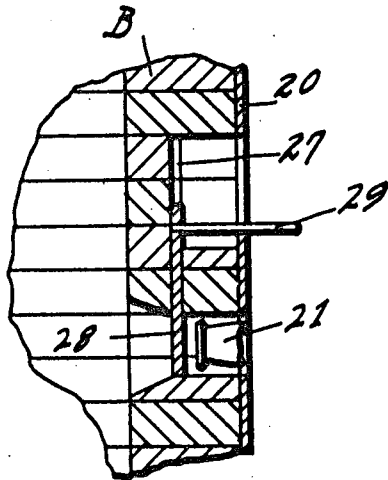


Fig. 4.

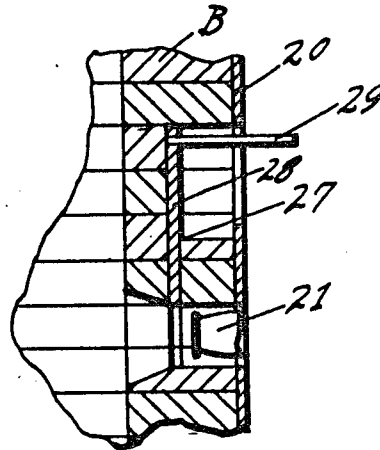


Fig. 5.

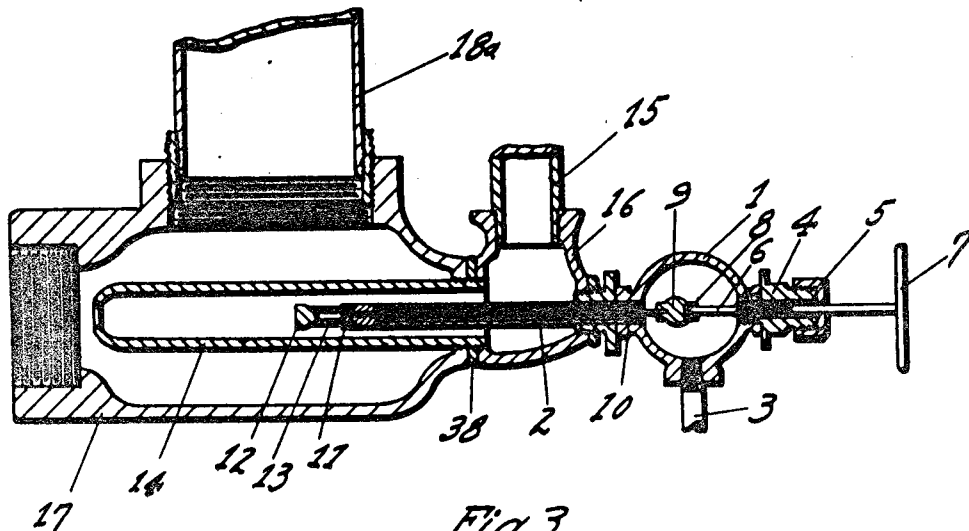


Fig. 3.

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HYDROCARBON-BURNER.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, FREDRICK J. NICE, a citizen of the United States, residing at Pontiac, county of Oakland, State of Michigan, have invented a certain new and useful Improvement in Hydrocarbon-Burners, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to hydro-carbon burners and to those that are especially adapted to burn crude oil or heavy hydrocarbons. With such a type of burner it is essential that the oil be thoroughly broken up and be given ample opportunity to mix with the incoming air, so that proper combustion may later take place. To secure these results I have designed a burner which I term a triple diffusion burner, for it is so arranged that the air strikes the fuel at three different points and the fuel goes through three mixing processes before it arrives at the mouth of the nozzle where it is burned.

A further object of my invention is a nozzle shield which may be dropped over the front of the nozzle to cut off the intense heat of the furnace when the nozzle is not in use.

A still further feature of my burner is a peculiar construction of spreader that is employed to spread the fuel, in the first instance, when it issues from the fuel pipe.

Other features are a divider which I find very effective in regulating the spread of the flame, and a novel form of perforated ring valve for controlling admission of air from the surrounding atmosphere.

A still further object is the employment of a relief valve that is calculated to give the air pressure uniformity, regardless of the action of the pumps, or other contingencies which may tend to fluctuate the pressure.

In the drawings:—Figure 1, is a side elevation of the burner and the air feeding system and oil feeding system by which it is fed. The furnace to which it is attached is shown in section. Fig. 2, is a section of the burner and furnace wall. Fig. 3, is an enlargement of part of the burner, showing more in detail the construction of the spreader and inner nozzle. Fig. 4, is a de-

tail section of a portion of the furnace wall, showing the nozzle shield over the nozzle. Fig. 5, is a similar detail section, showing the shield removed from in front of the nozzle. Fig. 6, is a section on the line 6—6 of Fig. 1. Fig. 7, is a similar section, showing the valve turned to closed position. Fig. 8, is an elevation of the front of the nozzle, showing the divider in position. Fig. 9, is a detail section of the ring valve and its seat. Fig. 10, is a detail of the adjustable attachment of the divider. Fig. 11, is a vertical section of the relief valve. Fig. 12, is a section of a high pressure nozzle that is interchangeable with the nozzle shown in Figs. 2 and 3.

1, is the valve casing into which fits the initial nozzle 2 and which has a fuel connection 3 that connects with a source of hydro-carbon. A valve-stem casing 4 screws into the valve casing 1 opposite the point of entrance of the initial nozzle. The outer end of the valve-stem casing is threaded for a cap 5. A valve-stem 6 threads through the valve-stem casing and is provided with a handle 7, by which it may be turned. The end of the valve-stem 6 has an annular enlargement 8 which turns freely in the block 9 to which the needle valve 10 is attached. This arrangement withdraws the needle valve from its seat, or pushes it upon its seat without turning it, thereby, preventing wear of the needle valve and its seat. Upon the end of the initial nozzle 2, there screws a spreader 11 which comprises a spreader block 12, the shape of a cone or frustum of a cone. I find that a block the shape of a frustum of a cone gives the best results as it spreads the fuel in a sheet while with the true cone block there is a tendency to bunch the fuel. The tapered end of the block is held opposite the opening in the nozzle by the bars 13.

It will readily be seen that as the fuel, under a pressure of say twenty-five pounds to the square inch, issues from the orifice in the nozzle, that it strikes against the tapered end of the spreader block and is spread to all sides of the inclosing secondary nozzle. An air current rushes into this secondary nozzle from the air conduit 15 which screws into the pipe union 16, from which the initial nozzle projects and into which the secondary nozzle 14 screws. This air current rushes about the initial nozzle and both aspirates the fuel and drives through the

hydro-carbon spreading from the spreader block and breaks it up into fine particules with which the incoming air mixes. The nozzle casing 17 screws upon the secondary nozzle 14 on the same threads that screw into the pipe union 16 and a packing ring 38 intervenes between the pipe union and the nozzle casing. This nozzle casing connects with a secondary air conduit 18^a. The air under pressure is admitted in larger quantities through this secondary air conduit and into the nozzle casing, rushing about the secondary nozzle 14 and mixing and breaking the mixture up that issues from the secondary nozzle 14. The nozzle casing 17 screws upon the coupling 18 which has an annular flange 19 that is bolted to the lining 20 of the furnace A.

A tertiary nozzle 21 is threaded into the interior threads of the nipple of the coupling 18. The mixture issuing from the mouth of the secondary nozzle 14 is augmented and further mixed by the air from the air conduit 18^a and is carried into the tertiary nozzle 21. The coupling 18 has a ring of perforations 22 which communicate with the atmosphere. The ring valve 23 can be oscillated on its seat through which these perforations penetrate. This ring valve 23 is perforated, as shown in Figs. 6 and 7, so that perforations may be brought into registry, partial registry, or out of registry with the perforations of the coupling. This affords a control of the atmospheric air drawn into the burner for combustion. A set screw 24 is threaded into the ring and projects into a short race cut in the valve seat to act as a limiter of the oscillating movement of the ring. It is only necessary to oscillate the ring a small part of a complete turn in order to bring the perforations into or out of registry and this screw 24, limits the possible rotative movement to only such as is necessary in the operation of the valve. The air which is admitted through the perforations 22 rushes in, due to the vacuum caused by aspiration of the mixture issuing from the tertiary nozzle 21. This inrushing air tends not only to break up the mixture further and form a more intimate union of the air with the fuel, but also affords a regulable quality of oxygen for combustion.

From the above description, it will be seen that a separate diffusion of the fuel and mixture takes place at the mouth of each of the three nozzles, affording, thereby, a triple diffusion burner.

In order to regulate the lateral spread of the flame, I employ a divider 25 which consists of heavy gage wire bent so as to extend up and partially across the mouth of the tertiary nozzle. The opposite end is looped for forming a slot to engage about the adjusting screw 26. By unloosening this

screw, which is threaded into the lining 20 of the furnace, the divider may be raised or lowered so as to project more or less into the path of the mixture issuing from the mouth of the tertiary nozzle. By this means the spread of the flame may be controlled. The refractory wall B of the furnace A is slotted at 27 and in this slot reciprocates a shield 28 which consists merely of a flat piece of heat-resisting material. A handle 29 is attached to the shield and projects through an opening to the exterior of the furnace. The operator may grasp this handle and raise or lower the shield as desired, the shield being held in any position by friction with the walls of the slot 27. This shield serves a very useful function in guarding the nozzle at times when it is not in use as it protects it from the intense heat of the furnace interior.

In Fig. 1, the air conduits are shown. The air is taken through the wall B of the furnace by the air main 30 and thereby warmed. The air passes through this main under a pressure of about sixteen ounces to the square inch. At the elbow 31 a relief valve 32 screws in. Opposite the entrance of the relief valve, the main continues to the coupling 33 where it divides into the conduits 18^a and 15. It will be noted that the conduit 15 is smaller than the conduit 18^a. I employ about 2½" piping for the main, 2" piping for the conduit 18 and about 1½" piping for the conduit 15. This affords about the correct proportion of air for the best results. The relief valve comprises a bell shaped casing 32 which has an annular opening 34 at its lower rim. A disk valve 35 is ordinarily seated upon its seat by the spiral spring 36. This prevents a communication between the openings 34 and the aperture in the passage of the elbow 31, but when the pressure rises above that to which the spring is adjusted by the cap nut 37, the valve 35 is lifted off of its seat and the pressure is thereby relieved. This is important, inasmuch as the pressure very often fluctuates, thereby preventing uniformity in the flames. I believe that I am the first one to secure such uniformity by providing devices for automatically assuring uniformity of pressure in the air delivered to the burner.

In Fig. 12, I have shown a high pressure nozzle which may be interchanged with the low pressure nozzle shown in Figs. 2 and 3 and numbered 14. This constricts the air passage from the conduit A and thereby increases the speed of the air issuing through the nozzle.

The nozzle structure above described in which the initial nozzle discharges into the secondary nozzle which is fed with compressed air from a separate valve controlled conduit is believed to be a distinct improve-

ment in that it furnishes an independent atomizer and oxygen supplier—the conduit 18^a. Referring to Fig. 1, it will be noted that each of these conduits 15 and 18^a has a valve in which the conduit 15 is the usual oxygen supplier and atomizing agent. When it is desired to run a low fire it becomes necessary to cut off the supply of oxygen by diminishing the supply of air through partial closing of the valve. This, however, depreciates the efficiency of this conduit as an atomizer of the fuel and as a result a great deal of the fuel drops at the orifice of the last nozzle without being properly prepared for combustion. In my present structure, this defect is overcome by using an independent air supplier that has independent means of control, that is, the conduit 18^a. When this conduit is opened up fully, the air rushes in and furnishes an abundant supply of oxygen to reach the highest temperatures. As a secondary function this air conduit throws the air across the orifice of the second nozzle and tends further to atomize the mixture.

When it is desired to have a low temperature fire in the furnace, as is needed when the furnace is not in use, but it is desired to keep it hot, the valve in the conduit 18^a is turned nearly closed or closed, which shuts off the oxygen supply, but does not affect the atomization of the fuel that issues from the initial nozzle, as the conduit 15 is still performing its atomizing function and furnishing sufficient air to supply the necessary oxygen for combustion at a low temperature. Temperatures above or below that secured by complete closure of the valve in the conduit 18^a may be secured without interfering with the proper preparation of the fuel by the regulation of the two valves in the conduits 18^a and 15.

What I claim is:—

1. In a device of the character described, the combination with a furnace, of a nozzle located therein from which the flame issues

and a divider comprising a rod portion projecting vertically in front of the nozzle and a portion extending to the exterior of the furnace where it has an adjustable connection therewith to adjust the same vertically, whereby the divider may be moved vertically in front of the nozzle to vary the amount of flame that is given a lateral spread, substantially as described.

2. An oil burner, having in combination, a flanged coupling that is boltable to the furnace wall and provided with air supply openings and a valve to control the same, a nozzle adapted to be screwed into the coupling, a nozzle casing that screws onto the end of the coupling opposite the flange, a secondary nozzle that screws into the nozzle casing at the end opposite its attachment to the coupling, a controllable air conduit attachable at an opening in the side of the nozzle casing, the said secondary nozzle arranged to discharge into said first mentioned nozzle, a pipe union attachable to the end of the nozzle casing opposite the end attached to the coupling, a controllable air conduit fitted into an opening in the side of the union, an initial nozzle fitted into the end of the pipe union opposite the attachment to the nozzle casing, said initial nozzle passing through the pipe union and projecting into the secondary nozzle, a spreader located in the secondary nozzle and in front of the mouth of the initial nozzle, a valve casing located at the end of the pipe union opposite the attachment to the nozzle casing, and a valve in said valve casing projecting into the initial nozzle for controlling the issue of fuel therethrough and an oil pipe leading into the valve casing, substantially as described.

In testimony whereof, I sign this specification in the presence of two witnesses.

FREDRICK J. NICE.

Witnesses:

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VIRGINIA C. SPRATT.