Nov. 2, 1948. D. C. BREAULT 2,452,543

APPARATUS FOR BURNING LIQUID FUEL IN THE PRESENCE OF GAS UNDER PRESSURE

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Fig. 1.

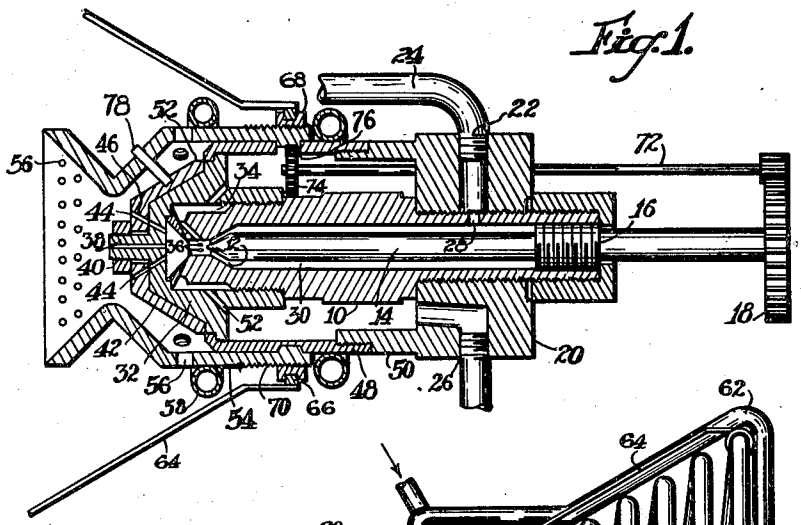
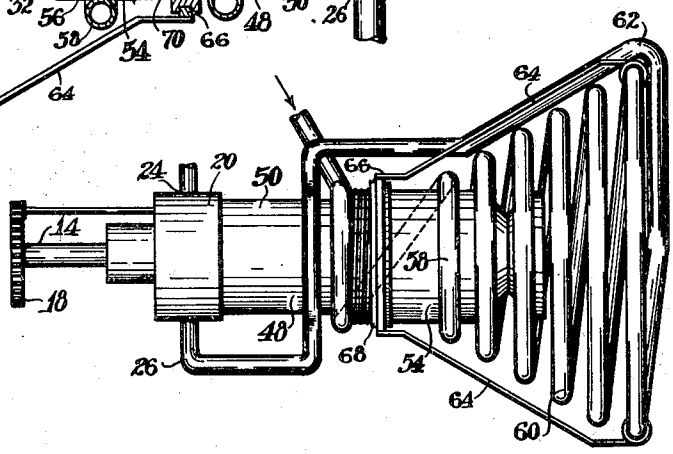



Fig. 2.



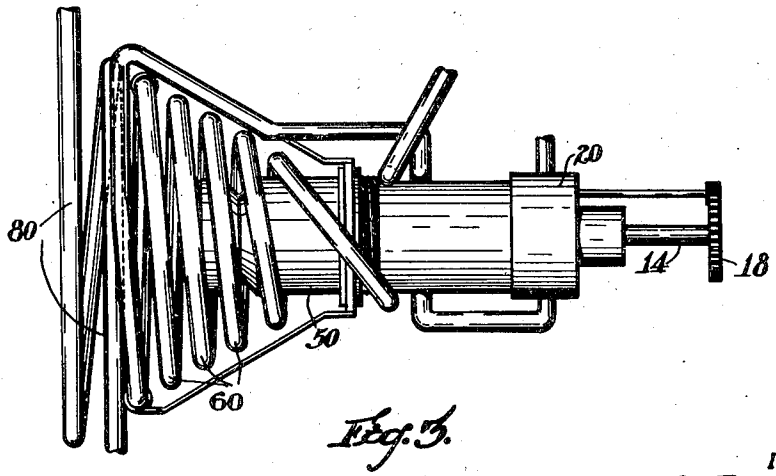




Fig. 3.

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## APPARATUS FOR BURNING LIQUID FUEL IN THE PRESENCE OF GAS UNDER PRESSURE

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Application January 15, 1944, Serial No. 518,317

4 Claims. (Cl. 158—73)

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This application refers to apparatus for the extremely economical burning of liquid fuel by complete atomization of the fuel which is burned in colloidal form.

Objects of the invention include the provision of means for directing a blast of air substantially angularly and opposite to an oncoming stream of liquid fuel in a closed chamber so that the air and fuel impinge with force and form an air-borne fuel fog in which the fuel is finely divided to a degree never before obtained. As is well known, the more finely divided the liquid fuel, the less the carbon residuum and by test, this apparatus produces a carbonless flame.

Further objects of the invention include the provision of means for the introduction of atmospheric air into the region of the flame, said means being easily adjustable to vary the volume of air so admitted.

Other objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawings, in which

Fig. 1 is a longitudinal cross-section of the invention with parts omitted for illustrative purposes;

Fig. 2 is a reduced elevational view of a form of the invention; and

Fig. 3 is a view similar to Fig. 2 but showing a modification as for refrigeration purposes.

The present invention is a continuation in part of my co-pending application Serial No. 494,484, filed July 13, 1943, and the present case is directed to improvements and variations not shown in the pending application referred to but embodies somewhat similar means for creating a mixture of oil and air finely divided in the form of a fog. It is to be understood that the burners are equally applicable to industries and domestic heating, to metal melting, etc. and to regrigeration.

As shown in Fig. 1 the present burner comprises an elongated hollow cylinder 10 having adjacent one end a valve seat 12 to accommodate a valve rod 14 having a pointed end for cooperation with the valve seat. A part of the interior of the element 10 is threaded for interengagement with enlarged threads 16 on the valve rod, whereby the same may be longitudinally adjusted to vary the flow of oil by means of a handle 18.

Element 10 is externally threaded for a part of its length to receive a block 20 which may be threaded thereon or otherwise secured thereto and in which is provided a passage 22 for reception of an inlet oil pipe 24. Block 20 is also provided with an air passage 26 to receive air under

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pressure. The oil passage 22 communicates with a passage 28 in a wall of element 10 and by this means oil is admitted to the interior of element 10 which forms an oil chamber 30 in which the valve rod 14 is centrally located.

The forward end of element 10 is threaded to receive a hollow cap 32. Element 10 is provided with an annular cut-away portion 34 which, in cooperation with the interior of cap 32, provides an air passage for a purpose to be described. A plurality of further air passages 36 are provided extending from the passage 34 angularly and reversely therefrom toward the interior of element 10 just in front of the valve seat 12. The extreme forward end of element 10 is made in the form of a funnel and is so designed in conjuction with cap 32 as to seal the interior of the funnel from the air passages just described. Cap 32 is provided with an extending boss or projection 38 having a passage axially aligned with the device and communicating with the funnel referred to. The outer end of the projection 38 is threaded for the purpose of receiving a nut 40 which secures a second cap 42 to and over the cap 32 as clearly shown. Cap 42 is provided with angular passages 44 which may communicate with similar passages 46 in cap 32. However, the cap 42 is not fixed to cap 32 and may rotate, thus varying the areas of the passages 46 in cap 32. By this means passages 46 may be varied in area or completely closed but the passage in the projection 38 is always open.

A cylinder 48 is secured to a flange 50 on the block 20 in spaced relation to element 10 and forms an air chamber therewith, and cylinder 48 secures a flange on cap 32 provided for the purpose to close this chamber. Air passages 52 provide communication between this air chamber and air passage 34.

It will be seen that the oil flows into the oil chamber 30 through pipe 24 and is admitted at valve seat 12 to flow into the funnel in the element 10, this funnel together with cap 32 forming an oil fog chamber. The air is conducted through passage 26 into the air chamber passing through passages 52 into the annular passage 34 and then into the inclined passages 36. As the air emerges from passages 36 it impinges head-on with the oil and atomizes the same forming an air-borne oil fog substantially in colloidal form. The oil and air pressures will force this fog outwardly through the axial passage in the projection 38 and also through passages 46 and 44 depending on the rotative position of cap 42.

A cylindrical shell 54 is arranged to substan-

tially enclose the nozzle as above described, and this shell is provided with various air passages 56 to direct atmospheric air to the region of the flame. There is provided a coiled pipe in the form of a cone having its small end surrounding shell 54 as shown at 58. This pipe is secured in fixed position to the nozzle in any desired manner and its coils 60 extend out beyond the forward end of the nozzle and gradually enlarge in diameter. The outermost coil 62 is secured to a bracket 64, which in turn is fixed to a ring or other support 66, the latter being mounted in a groove in a ring or other desired support 68. The coils 58, 60 and 62 form an additional means for admitting atmospheric air into the region of the flame and by circulating the in-coming air in the coil the same will be preheated, thus heating the oil in chamber 30 and improving the combustion by reason of the added heat. Either the small or large end of the coil may be connected to the air intake 26 for this purpose and the atmospheric air will enter the region of the flame by flowing in between the coils. If it is so desired, the coils may be adjusted so as to admit either more or less atmospheric air merely by stretching the entire air heating pipe and this may be done by any convenient means or as illustrated herein the rings 68 may be turned up on threads 70. Since the small end of the coil is fixed and the large end is connected to ring 68 the largest coil 62 can be moved to or away from the nozzle. The ring 68 may be rotated manually or by means of a shaft 72 which may engage handle 18 and which is provided with a gear 74 which may extend through a small aperture in a wall of cylinder 48 to engage an internal rack at 76 on the shell 54, by which means the latter may be rotated, thus moving ring 68 axially thereof. Any other means may be used for stretching the coil, but in the present case the valve rod 14 being coupled therewith the coil will be stretched to admit more atmospheric air the greater the degree of opening of the valve.

Also it may be desired to actuate cap 42 to vary the size of the oil fog passages 46, and in this case it is merely necessary to connect shell 54 with cap 42 as by a pin or other means 78, and if this construction is used, the coil supplying atmospheric aid and the oil fog passages will all be simultaneously adjusted. However, it is pointed out that the present invention does not depend upon this combination of parts but is equally successful if the coils 58, 60, 62 are manually adjusted, and also if the cap 42 is likewise manually adjusted.

In the event that the present invention is designed for use for refrigeration another coil is added as shown in Fig. 3 wherein the added coil 80 is used to carry the refrigerant. Otherwise, however, the construction may be the same, but in some cases the entire coil may be used for the refrigerant, with no preheating.

The above described invention presents an extremely economical apparatus for burning liquid fuel. Under actual test optimum combustion conditions are obtained for the various ranges of oil, there being no carbon formed and an extremely small amount of oxygen and gases of combustion present. The passage in the projection 38 may be used as a pilot when passages 46 are shut off, and in actual operation the flame caused by the oil fog issuing from this passage will prevent the formation of a vacuum in the center of the flame area.



Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:

1. Liquid fuel burner comprising a nozzle for projecting fuel in a predetermined direction for burning, a pipe for leading the fuel into the nozzle, said pipe being coiled coaxially of and in advance of the nozzle to preheat the fuel, and means to vary the spacing of the turns of the coiled pipe to vary the amount of air induced through the coil by the fuel projected from the nozzle.

2. Burner of claim 1 wherein the coil is conical in shape with the largest turn spaced from the nozzle and the smallest turn coiled about the nozzle.

3. Burner of claim 1 including a fuel valve, means to adjust the valve, and means connected thereto to simultaneously operate the coil spacing means.

4. Apparatus of claim 1 wherein one end of the coil is fixed relative to the nozzle and the other end is movable to vary the distances between turns of the coil.

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