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OIL BURNER

Filed Nov. 27, 1936

Fig. 1.

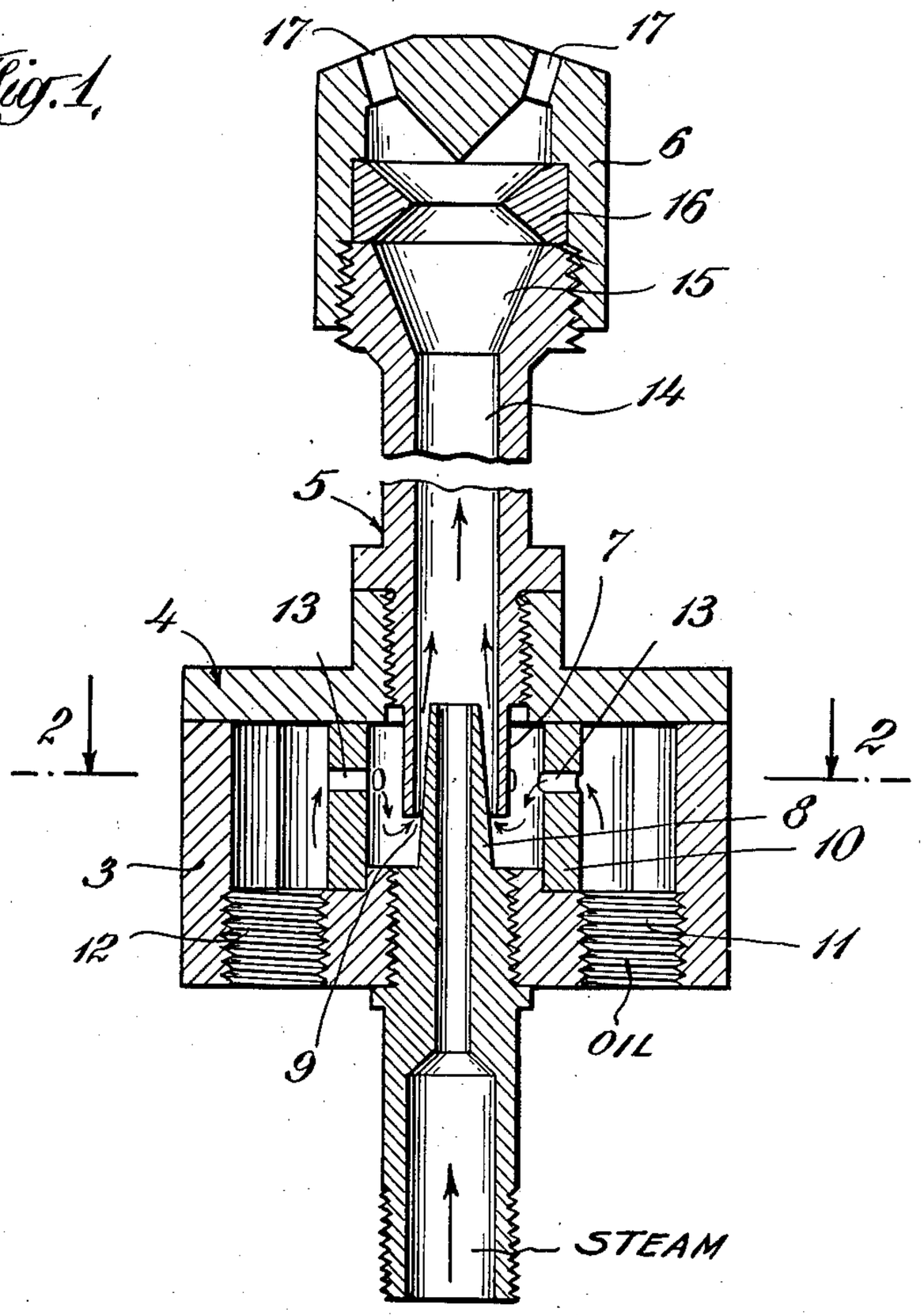
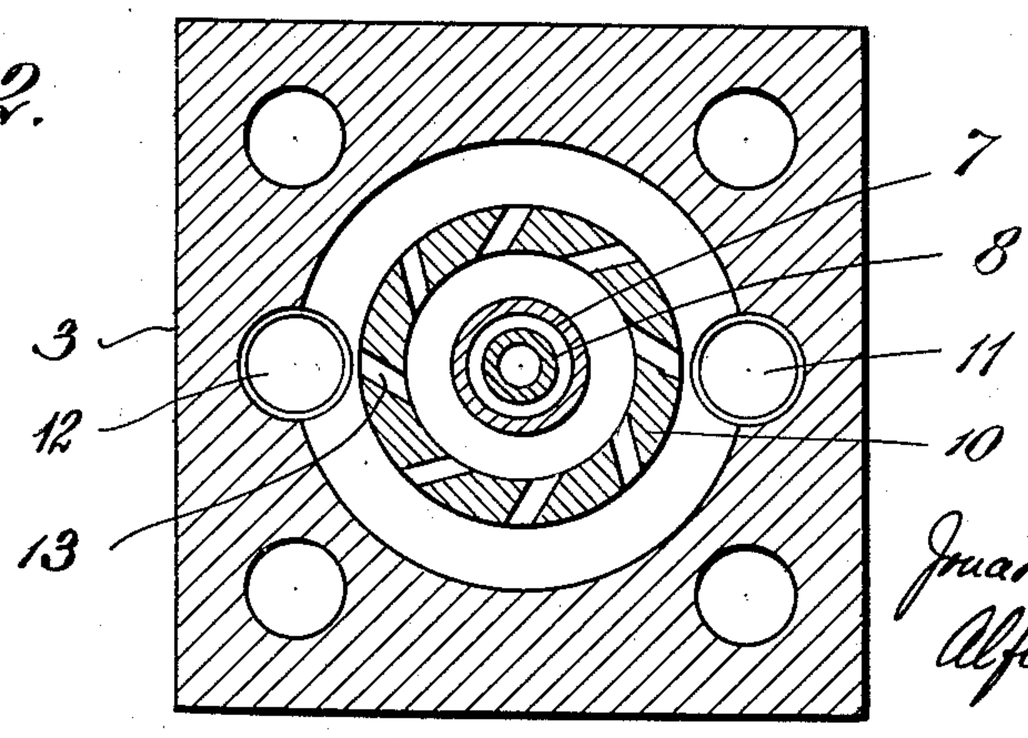


Fig. 2.



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OIL BURNER

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Application November 27, 1936, Serial No. 112,880

1 Claim. (Cl. 299—140)

This invention relates to improved devices for the burning of fuel oils, and is particularly concerned with devices of the form in which the oil is aspirated and forced through the burner, and atomized either by steam or by primary air supplied to the burner under pressure.

This invention has for its object the provision of a burner of improved design capable of operation with a minimum of difficulties from clogging and capable of delivering to the flame an intimately mixed and atomized stream of fuel.

This invention will be best understood by reference to the drawing attached to this specification, in which Figure 1 shows a longitudinal section of the burner, and Figure 2 shows a detailed cross-section of a portion of the burner. In Figure 1, the burner is seen to consist of a fluid chamber designated by 3, covered by a plate 4, to which is attached a mixing tube 5, carrying a burner head 6. The mixing tube 5 has an extension 7, into the interior of the fluid chamber defined by parts 3 and 4. Attached to the other side of fluid chamber casting 3, and extending thereinto is the nozzle for the aspirating fluid, commonly steam. This steam nozzle ends in a conical tapered nozzle 8, which projects within the mixing tube extension, leaving between parts 7 and 8 an annular passage 9, through which the fuel is aspirated into the mixing tube 5. Within the fluid chamber formed by parts 3 and 4, and surrounding the mixing tube extension 7, and the nozzle 8, there is a baffle member 10, which serves to define an annular space within the fluid chamber and surrounding the aspirating device, and divides the fluid chamber into an outer and an inner chamber. Fuel oil may be introduced to the outer fuel chamber through orifice 11; orifice 12 also communicates with this outer fuel chamber for a purpose later discussed. Fluid from the outer fuel chamber may pass through part 10, into the annular space surrounding parts 7 and 8, by ports 13. Referring to Figure 2, it will be seen that these ports 13 in member 10 are arranged tangentially, so that the fluid in the inner annular chamber is given a rapid swirling motion.

Returning to Figure 1, it will be noted that mixing chamber 5 has a passage of uniform diameter 14 throughout most of its length, but that this passage is abruptly widened at 15 near the end of mixing tube 5. It will also be observed that burner head 6 serves to hold against the end of mixing tube 5 a sharp edged constricting member 16, so that the oil and steam mixture passing through mixing tube 5 is further mixed by a relatively sharp expansion in 15, followed by a sharp constriction through 16 before it passes into the distributing chamber at the burner head 6, from which it passes to the flame through a plurality of holes 17.

In operation of this burner, it is found that the straining action of the passages 13, together with their tangential setting serve to greatly minimize any difficulties which may be had with clogging of the annular passage 9, due to particles of coke, dirt and the like which may be carried in with the fuel oil. Also, the relatively great radiating surface of the fuel chamber casting 3 and the relatively large amount of oil in the outer chamber serve to maintain a low temperature in the inner fuel oil chamber in spite of the heat conducted to it along the mixing tube 5, and by radiation through the orifice in which the burner is placed and so largely prevent any substantial coking of the oil in the inner chamber. This effect is also assisted by the swirling motion in the inner chamber, which does not permit any dead pockets of oil to remain in contact with heated metal for any considerable portion of time sufficient to bring about decomposition of the oil. The fuel chamber 3 is provided with port 12, so that if desired under extremely rigorous conditions, or with extremely dirty oil, the fuel oil may be recirculated through the outer fuel chamber in an amount considerably in excess of that used for fuel. In this case, the rapid circulation of the oil in the outer fuel chamber serves as an additional cooling medium, and also serves to keep the outer end of the ports 13 clear of particles of coke, since the velocity past these ports will be greater than the velocity into them.

Turning to the internal construction in the burner and of the mixing tube, it is found that the combination of the sudden expansion into chamber 15, followed by the sudden constriction by member 16, tends to deliver an oil-steam mixture more nearly completely atomized and more suitable for burning than does an unmodified mixing chamber of considerably greater length. The constriction at 16 also permits of designing the burner head 6 so that the combined area of the holes 17, as well as of the distributing chamber from which they open may be sufficiently great so that no back-pressure is developed at this point. Where the area of the holes 17, or their equivalent is made use of to control the pressure drop through the mixing tube 5, it is very difficult to carry heavy loads without building up sufficient pressure in 5 so that steam will flow back through the annular space 9, and put the burner out of service. On the other hand, where the combined

area of holes 17, or their equivalent, is comparatively large in relation to the area of the passage 14, it is difficult to secure efficient mixing without an extremely long passage 14.

We claim:

In a fluid fuel burner, a fuel supply chamber, a mixing tube, and a nozzle for aspirating fluid, all coaxial: the mixing tube extending within the fuel supply chamber, the nozzle extending through the fuel supply chamber and terminating within the mixing tube and forming, together with the tube wall, an annular passage for entry of fuel into said tube, a partition dividing the fuel supply chamber into an interior and an exterior chamber, ports in said partition for the passage of fuel therethrough, said ports being so located as to force the fuel to pass with a rotating or swirling motion over said annular passage; said mixing tube further comprising the following parts in order in the direction of fluid flow: an elongated tubular passage of uniform cross-section without interior restriction, a relatively short section in which the cross-section is rapidly expanded, a constrictive orifice of cross-sectional area approximately equal to that of the long tubular passage, a burner head having a distributing chamber of greater cross-section than the orifice, and in said burner head passages for the exit of the mixed fluids.

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