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FLUID FUEL BURNER

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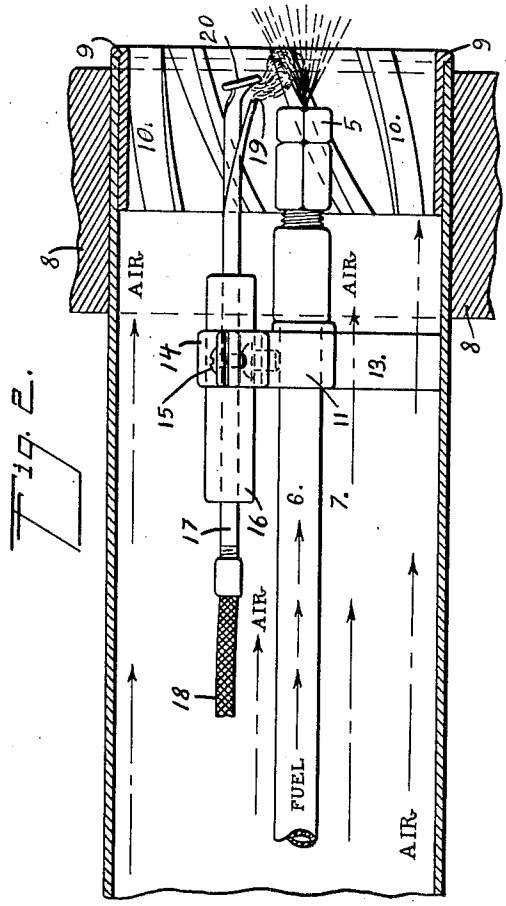


Fig. 2.

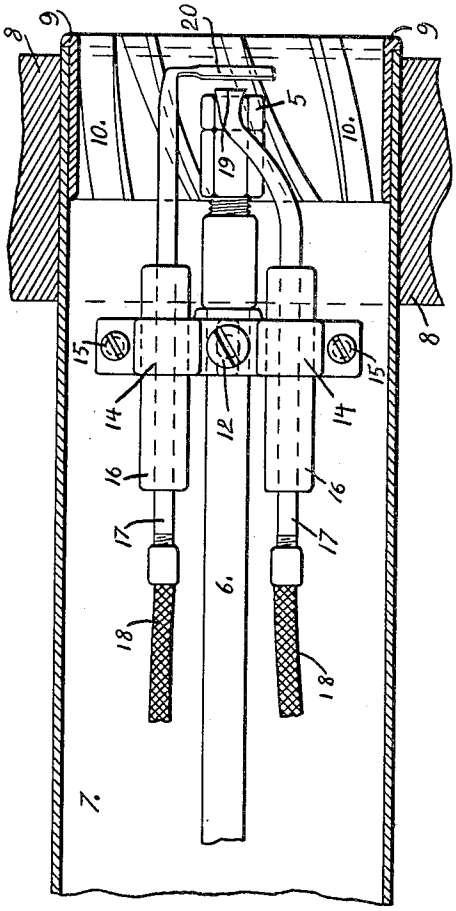


Fig. 1.

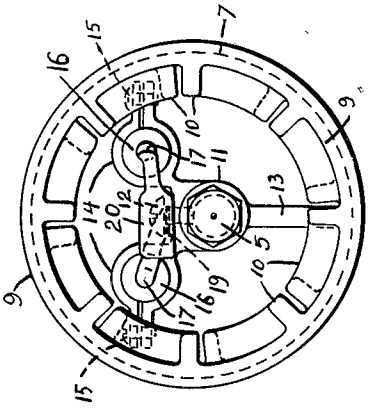


Fig. 3.

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FLUID FUEL BURNER

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2 Claims. (Cl. 158—28)

My invention relates to burners for fluid fuels, such as gas and oil, wherein the fuel is delivered from a nozzle into a stream of air moving axially of the nozzle, and wherein the fuel is mixed with the air, ignited and burned in a zone adjacent to the nozzle. It is the object of my invention to provide, for burners of the foregoing character, a combined electrical ignition and air-directing device whereby the ignition electrodes may be positioned outside the path of the fuel emerging from the nozzle, and the arc or succession of sparks which pass between the electrodes be carried by a deflected portion of the air-stream into the path of the fuel to ignite the same. A further object is to provide means for effecting a whirling or twisting motion of the peripheral portion of the air-stream without interfering with the directing of that part of the air-stream which carries the ignition arc into contact with the fuel.

In the accompanying drawing Fig. 1 is a plan view of devices embodying my invention, the associated draft-tube being in horizontal section, Fig. 2 is a side view, the draft-tube being in vertical section, and Fig. 3 is an end view of the device.

In the illustrated embodiment of my invention the same is applied to an oil burner wherein the fuel-nozzle 5 is carried at the end of a pipe 6 through which the oil is supplied under pressure, the nozzle having at the end thereof a small central aperture through which the fuel emerges in a conical spray. The fuel-pipe extends longitudinally within a much larger pipe or draft-tube 7, through which the air is supplied for supporting combustion of the fuel, the air usually being under forced draft, being impelled by a fan or blower such as is commonly employed in this art. The draft-tube is extended through the wall 8 of a furnace to the combustion-chamber thereof, said tube terminating at or near the inner side of said wall, and the fuel-pipe being arranged so that the nozzle 5 is near the end of the draft-tube but does not project therefrom.

Preferably, there is disposed within the rear or inner end of the draft-tube a sleeve 9 having formed integrally therewith a plurality of helical ribs 10 adapted to cause a whirling motion of the air-stream emerging therefrom. Within the draft-tube, and spaced forwardly or outwardly from the end of the sleeve 9, is a support comprising a hub-portion 11 fitting upon the fuel-pipe and secured thereto by a screw 12, a leg-portion 13 extending downwardly from said hub 11 and resting upon the bottom of the draft-tube, and a pair of collar-portions 14 arranged symmetrically at opposite sides of the hub above the fuel-pipe. The collar-portions 14 are kerfed and provided at the kerfs with clamp-screws 15 for holding therein the insulating-sleeves 16 which surround the stem-portions 17 of the ignition-electrodes. Said stems 17 are parallel with each other, being held by the support and the insulating sleeves 16 in positions intermediate the fuel-pipe and the sides of the draft-tube, at a level above the fuel-pipe and the nozzle. To the outer or front end of the stems 17 are connected suitably insulated conductors 18 which are extended through the draft-tube alongside the fuel-pipe to connect with the coil, transformer or other source of high-tension current employed for the ignition. The rear end of one of the electrodes is curved laterally as shown in Fig. 1, and slightly downward as shown in Fig. 2, so that the end of the electrode is above and extends slightly beyond the end of the nozzle, said end of the electrode having a flat horizontal terminal edge 19 extending transversely to the axis of the nozzle and draft-tube. The rear end portion of the other electrode is bent laterally, substantially at a right angle as shown in Fig. 1, to extend transversely in spaced relation to the end 19 of the first electrode, the transverse terminal portion being flattened to form a substantially rectangular plate 20 which is inclined, as shown in Fig. 2, so that its lower edge is rearward of its upper edge.

In the operation of the described burner, the fuel is sprayed from the nozzle in a conical formation, as indicated in Fig. 2, and the outer portion of the air-stream through the draft-tube is given a whirling or twisting motion by the helical ribs 10 in the annular space about the mouth of said tube. The central portion of the air-stream tends to move along paths substantially parallel with the axis of the nozzle, but at the end of the nozzle the air-stream forms an eddy about the transverse end-surface thereof, and the fuel-jet or spray also tends to entrain and draw portions of the air in toward the axis thereof. The flat transversely extending inclined terminal-plate 20 intercepts a portion of the air-stream and directs the same downwardly toward the spray-cone of the fuel, and said deflected portion of the air-stream passes between said plate 20 and the terminal edge 19 of the other electrode. Said deflected portion of the air-stream causes the arc, or suc-

cession of sparks passing between the terminals 19 and 20, to assume a U-shaped formation, bowing downwardly from the terminals and contacting with the spray-cone of the fuel to effectively ignite the same. The gap or distance between the terminals 19 and 20 is so proportioned that the initial spark or electrical discharge is readily formed between the same, and the potential of the ignition-current employed is such that after the initial discharge or breakdown of the gap the path of the alternating arc or series of sparks passing between the electrodes may be greatly elongated and assume the deeply bowed U-formation represented in Fig. 2, before disruption of the arc will occur.

It will be seen that by the described structure the ignition electrodes are relatively distant from the path of the fuel and cannot contact with or become fouled thereby, or accumulate carbon deposits which might short-circuit and render the same inoperative. The wide end-face 19 of the one electrode and the plate 20 of the opposed electrode afford relatively large areas between which the ignition arc may pass, so that pitting or erosion of a portion of the surface will not alter the width of the gap as a whole nor prevent normal continuation of the ignition.

In burners of this class it appears to be necessary, or highly desirable, to provide means for producing a whirling or twisting motion of the main body of the air-stream emerging from the draft-tube about the fuel-nozzle, such motion of the air-stream causing a more rapid and effective mixing of the air and fuel, and greatly reducing the roaring noise caused during operation of the burner. The usual means for producing the twisting movement of the air-stream, comprises helicoidal blades or vanes positioned within the draft-tube forwardly of the fuel-nozzle and relatively distant from the end or mouth of the draft-tube, so that all of the air passing the nozzle is disturbed and deflected by such air-directing means. In my improved structure, the helical ribs 10 on the sleeve 9 in the mouth of the draft-tube, produce the desired whirling motion of the air and quiet operation of the burner, although said ribs affect directly only the outer or peripheral portion of the air-stream, and thus avoid interference with the directing of the central portion of the air-stream to produce the desired bowed formation of the ignition arc.

Now, having described my invention, what I claim and desire to secure by Letters Patent is:

1. In a fluid fuel burner, the combination with a fuel-nozzle adapted to deliver a jet of fuel, and a draft-tube surrounding said nozzle and adapted to direct an air-stream longitudinally past the same; of ignition-electrodes disposed adjacent to said nozzle and having wide terminal portions spaced apart longitudinally of the draft tube and extending transversely thereof, the forward of said transverse terminal portions having a face at the gap between the electrodes inclined to the draft-tube axis, and said inclined face being positioned to deflect a portion of the air-stream through the gap and toward the fuel-jet, for the purpose set forth.

2. In a fluid fuel burner, the combination with a draft-tube provided at the discharge mouth thereof with annularly arranged helical air-directing means, and a fuel-nozzle arranged centrally of said mouth in spaced relation to said air-directing means; of ignition-electrodes disposed adjacent to said nozzle and having wide terminal portions spaced apart longitudinally of the draft-tube to provide a gap between them, the forward of said terminal portions being shaped and arranged to direct air through said gap toward the orifice of the nozzle.

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