Aug. 30, 1949. S. LETVIN 2,480,147

FIRING DEVICE FOR COMBUSTION APPARATUS

Filed Jan. 29, 1947 2 Sheets-Sheet 1

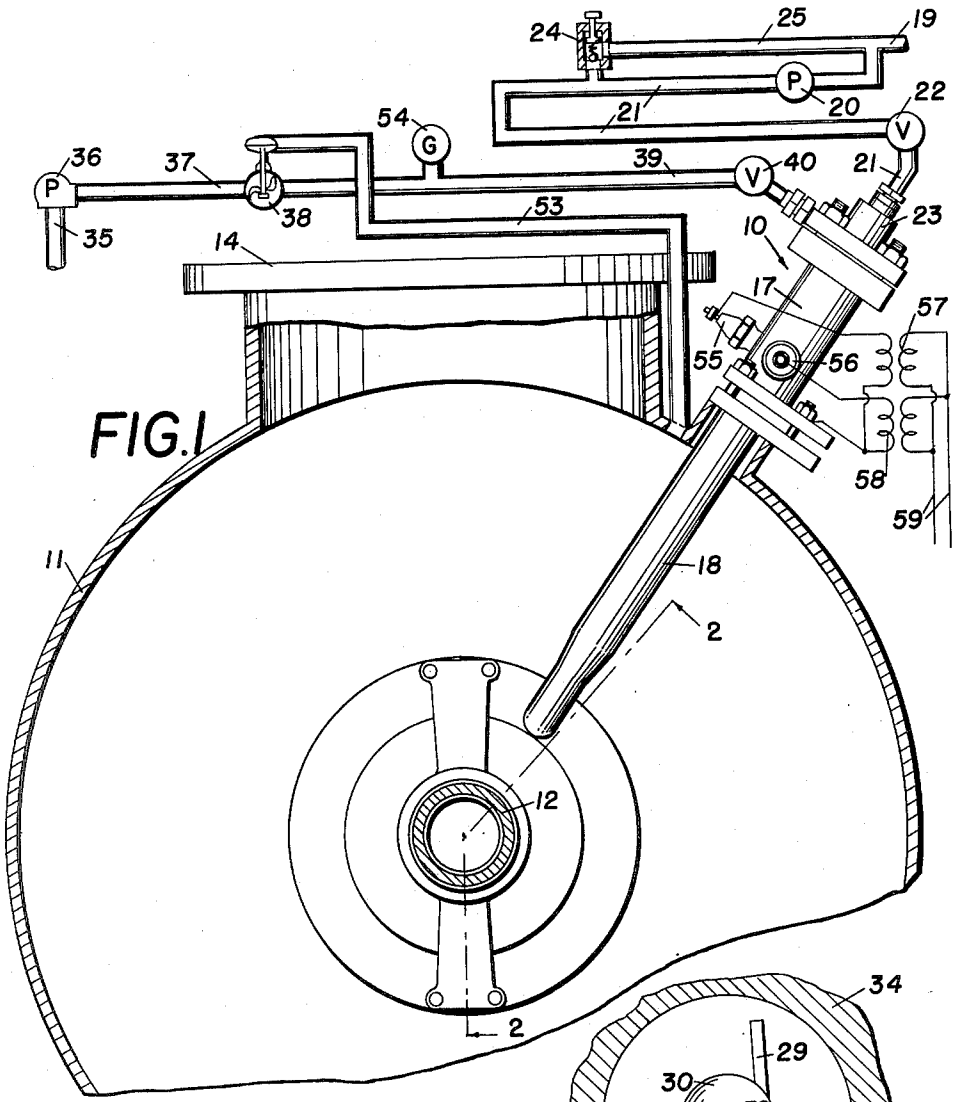

FIG. 1

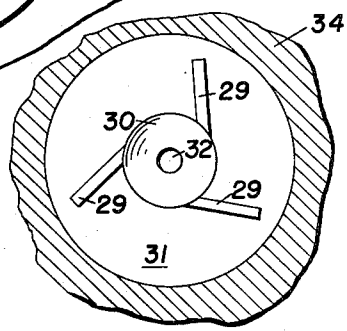

FIG. 5

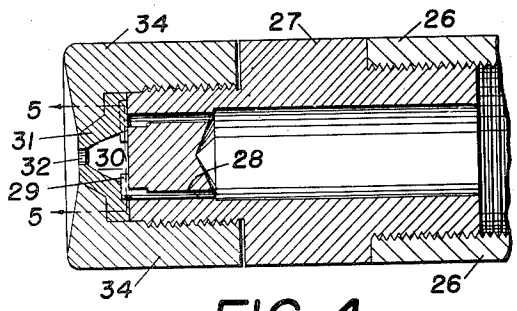

FIG. 4

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FIRING DEVICE FOR COMBUSTION APPARATUS

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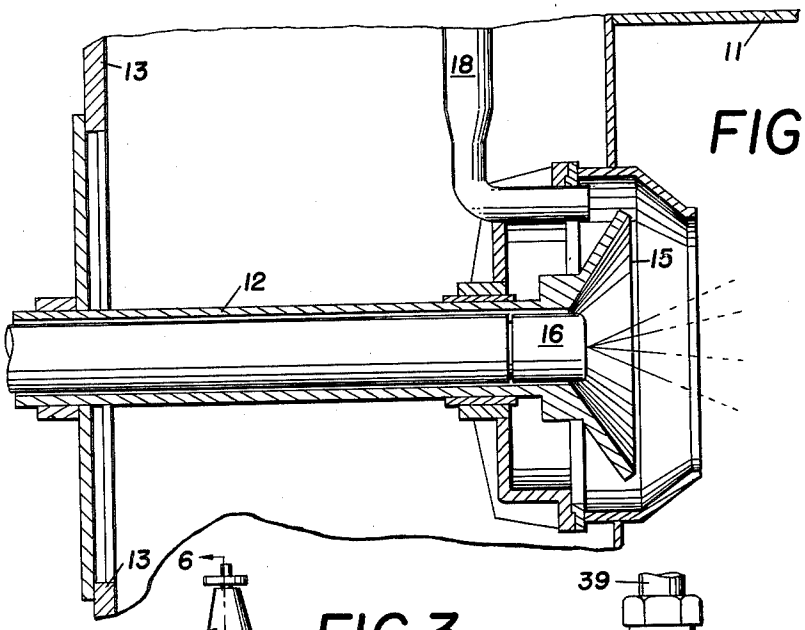
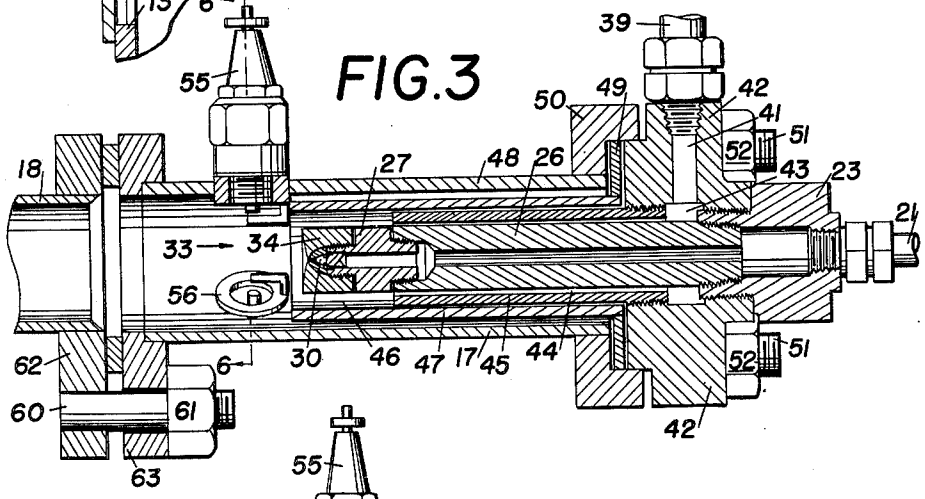


FIG. 2

FIG. 3



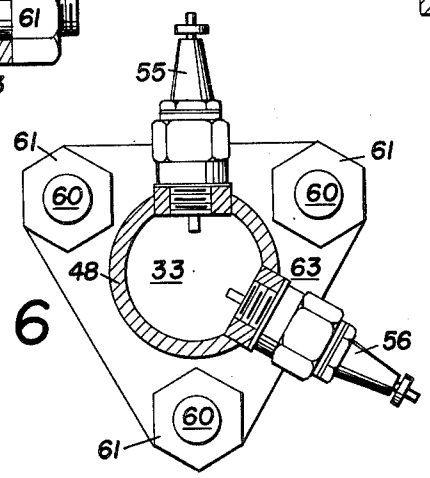


FIG. 6

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FIRING DEVICE FOR COMBUSTION APPARATUS

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Application January 29, 1947, Serial No. 724,938

2 Claims. (Cl. 158—28)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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This invention relates to firing devices.

The invention provides a novel firing device that is particularly adapted to fire combustion chambers operating at high pressures, although it is applicable as well to firing boiler furnaces, burners and other combustion apparatus.

An object of the invention is to provide a firing device having a continuously projected flame, that operates on the same fuel as that employed in the principal burner and that has its entire mechanism outside of the chamber, burner or vessel to be fired.

Another object is to provide a firing device capable of functioning over a wide range of combustion chamber pressures, for example, from zero to 100 pounds per square inch.

Another object is to provide a firing device in which control is simple and requires only that a higher pressure be maintained at the air inlet to the atomizer of the device than exists in the combustion chamber, and that the fuel pressure to the atomizer be sufficient to cause the fuel to flow to the device and be atomized.

The nature of the invention will be understood from the following description when considered in connection with the accompanying drawings forming a part thereof, and in which:

Fig. 1 is a transverse sectional view of a combustion chamber having a firing device of the invention,

Fig. 2 is a sectional view along line 2—2 of Fig. 1,

Fig. 3 is a longitudinal sectional view of the outer end portion of the firing device,

Fig. 4 is an enlarged longitudinal sectional view of the atomizer shown in Fig. 3,

Fig. 5 is a sectional view on line 5—5 of Fig. 4, on an enlarged scale, and

Fig. 6 is a sectional view on line 6—6 of Fig. 3.

The firing device designated generally 10, is shown in association with a combustion chamber 11 for firing the burner 12. The combustion chamber has a cylindrical air casing 13 at one end thereof, to which air is supplied through an inlet 14, and from which the air flows around the burner diffuser 15 to mix with the atomized oil discharged from the burner tip 16.

The firing device 10 comprises generally an atomizer section 17 and a tubular flame-conducting section 18. Fuel for the atomizer is supplied through a feed line 19 and is forced by a pump 20 through line 21 and through control valve 22 to the atomizer connection 23. Pump 20 maintains a pressure on the fuel which is sufficient to cause the fuel to flow to the atomizer

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and be atomized. Excess fuel delivered by pump 20 flows through pressure release valve 24 and through return line 25 to the feed line 19. Fuel delivered to the interior of the connection 23 flows through the barrel 26 to the nozzle body 27 of the atomizer and through three longitudinally extending passages 28 in the outlet end portion of the body 27 to the outer ends of three tangential slots 29 that deliver the fuel into the chamber 30 of the sprayer plate 31 wherein it rotates rapidly and from which it is discharged in the form of a spray through opening 32 into the ignition zone 33 of the atomizer section 17. Sprayer plate 31 is maintained in position against the nozzle body 27 by an atomizer tip 34 that is threaded on the end of the body 27.

Air is supplied to the firing device through a supply line 35 to a blower 36 which forces the air through line 37 and through a regulator valve 38, thence through line 39 and control valve 40 to the atomizer section 17. The air enters flange 42 and flows thro igh a passage 41 in the flange to an annular chamber 43 that is disposed around a part of the barrel 26 adjacent its end. The air flows from the chamber 43 through an annular passage 44 between the barrel 26 and a primary air tube 45 that is outside of and concentric with the barrel 26, and is discharged into an enlarged annular space 46 between the nozzle body 27, the tip 34 of the atomizer and the inner end portion of a secondary tube 47 that is outside of, spaced from, and concentric with the primary air tube 45. The barrel 26, nozzle body 27, atomizer tip 34, the primary and secondary tubes 45 and 47, and the ignition zone 33 are enclosed by a tube 48 that is spaced from and is concentric with the secondary tube 47.

The several parts of the atomizing section are maintained in position in the manner shown. The connection 23 has its inner end threaded into the outer side of flange 42 and the outer end of barrel 26 is threaded into the connection 23 and thus the barrel and atomizer are supported in position with respect to the flange 42. Primary air tube 45 has its outer end threaded into the inner side of the flange 42. The outer end of the secondary tube 47 has an annular flange 49 welded thereto and positioned between the flange 42 on one side and on the other side the outer end of tube 48 and a cup-shaped flange 50 welded thereto. Flanges 42, 49 and 50 are held together by bolts 51 that extend from flange 50 through flange 42 and have nuts 52 threaded thereon.

The pressure existing in the combustion chamber 11 is transmitted to one side of the diaphragm

of the regulating valve 38 by a static line 53. The regulating valve is set to maintain a pressure of about one pound per square inch above the pressure in the combustion chamber. A gauge 54 indicates the pressure existing in air line 39.

The fuel and air mixture delivered to the ignition zone 33 is ignited by two spark plugs 55 and 56 to which high-tension current is supplied by transformers 57 and 58, respectively, that receive current from the line 59. The flame so produced flows through flame conducting section 18, to a point to the rear of the diffuser 15 of the burner 12, where it is discharged toward the diffuser and flows around it and into contact with the ignitable fuel-air mixture issuing from the burner. Tubular section 18 is connected to the atomizer section 17 by bolts 60 and nuts 61 that secure together a triangular flange 62 welded to the inlet end of the section 18 and a triangular flange 63 welded to the outlet end of the tube 48.

This firing device operates on the same type of fuel that is supplied to the burner 12, thereby eliminating the necessity for maintaining a separate supply of a different fuel. The fuel is supplied to the firing device with sufficient pressure by pump 20 to cause the fuel to be atomized, and air is supplied to the igniter by blower 36 in a quantity that is sufficiently in excess of the amount of fuel to permit proper combustion to be maintained in the ignition zone 33. Flame is projected continuously from the discharge end of the tube 18, thus ensuring the firing of the burner 12. The firing device functions over a wide range of combustion chamber pressures, at least from zero to 100 pounds per square inch. Control of the firing device requires only that (1) a higher pressure be maintained at the air inlet to the atomizer than that existing in the combustion chamber, which is ensured by the operation of the regulating valve 38, and that (2) the fuel pressure to the atomizer be sufficiently in excess of the combustion chamber pressure to cause the fuel to flow to the atomizer and be atomized, which is ensured by the operation of pump 20.

The flame discharging end of the firing device need not be positioned up-stream of the burner 12 as shown, so long as it is located so that the flame from the firing device readily ignites the air-fuel mixture from the principal burner or burners of the installation with which the igniter is used. Such principal flames can also be generated by causing the pilot or secondary flame from the firing device to enter the zones in the wake of or downstream from the burner, or to be projected through an orifice in the diffuser of the burner to the region contiguous to the atomizer orifice of the burner.

It is to be understood that various modifications and changes may be made in this invention without departing from the spirit and scope thereof as set forth in the appended claims.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

1. In combustion apparatus, means forming a combustion chamber and a firing device therefor, said device comprising an atomizer having a discharge port; a first tubular member for supplying fuel to said atomizer, fuel-inlet means in the first tubular member; a second tubular member coaxial with the first tubular member and outside of and spaced from the first tubular member, the space between said members forming an air-supply passage, air-inlet means connecting with said passage, the second tubular member terminating short of the atomizer discharge port; a third tubular member coaxial with the second tubular member and outside of and spaced from the second tubular member, the third tubular member extending slightly beyond the atomizer discharge port; and a fourth tubular member coaxial with the third tubular member and outside of and spaced from the third tubular member, the fourth tubular member at one end extending beyond the third tubular member into the combustion chamber to define an ignition zone, an igniter in said zone, said fourth tubular member at the other end being sealed relative to the second tubular member.

2. In combustion apparatus, means forming a combustion chamber and a firing device therefor, said device comprising an atomizer having a discharge port; a first tubular member for supplying fuel to said atomizer, fuel-inlet means in the first tubular member; a second tubular member coaxial with the first tubular member and outside of and spaced from the first tubular member, the second tubular member terminating short of the atomizer discharge port, the space between said members forming an air-supply passage, air-inlet means connecting with said passage; a third tubular member coaxial with the second tubular member and outside of and spaced from the second tubular member, the third tubular member extending slightly beyond the atomizer discharge port, the space between the third tubular member and the atomizer being in communication with the air-supply passage and forming an enlarged air chamber; a fourth tubular member coaxial with the third tubular member and outside of and spaced from the third tubular member, the fourth tubular member at one end extending beyond the atomizer to define an ignition zone, an igniter in said zone, the fourth tubular member at the other end being sealed relative to the second tubular member to prevent ingress of fluid to the ignition zone externally of the second tubular member; and a flame guide at one end forming a fluid seal with the fourth tubular member and at the other end extending into the combustion chamber.

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