June 6, 1939. W. J. SMITH ET AL 2,161,436

OIL BURNING APPARATUS

Filed Dec. 20, 1937 2 Sheets-Sheet 1

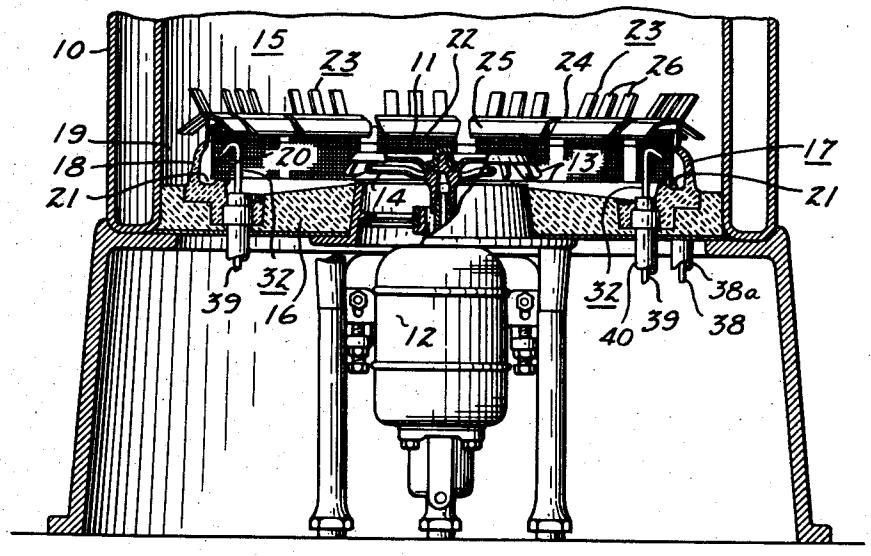


Fig. 1

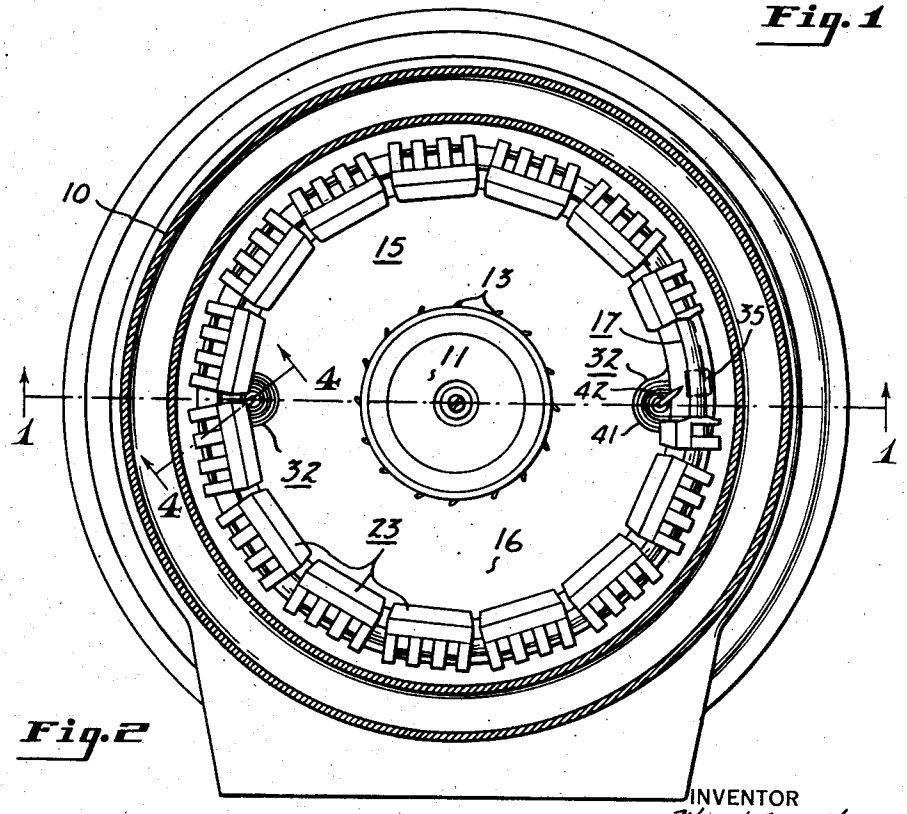


Fig. 2

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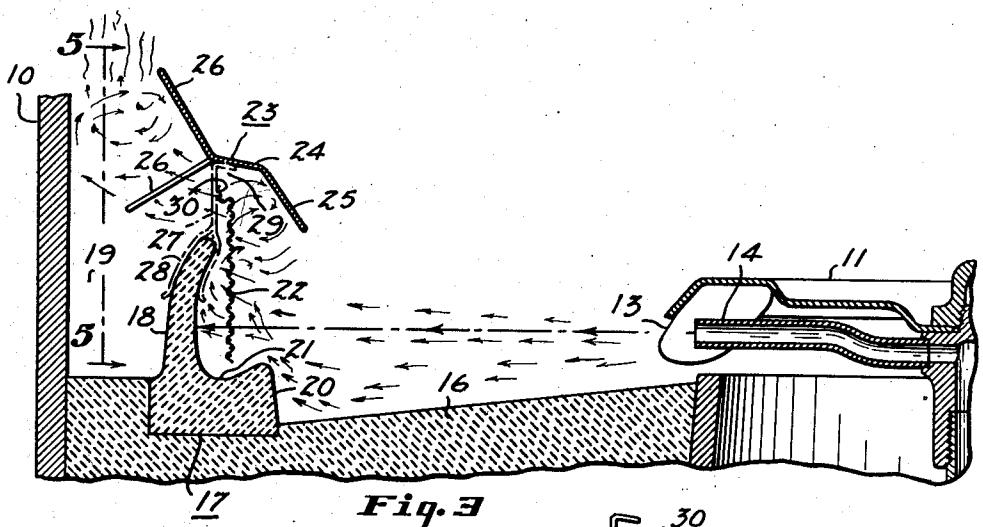


Fig. 3

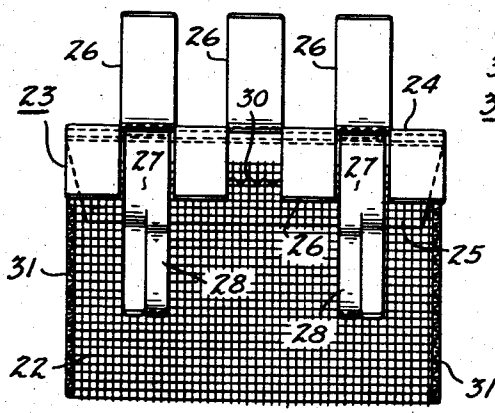


Fig. 5

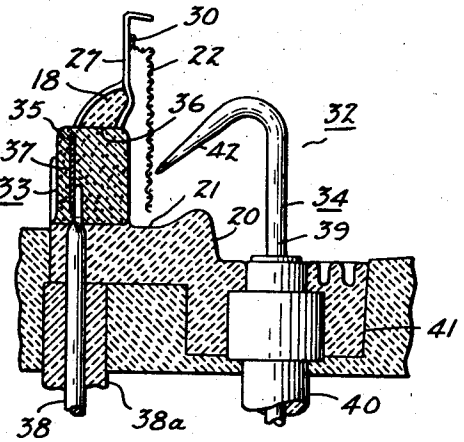


Fig. 4

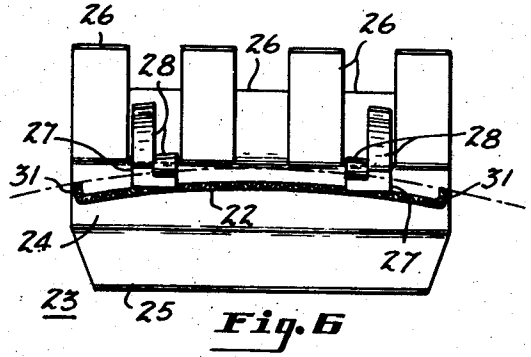


Fig. 6

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OIL BURNING APPARATUS

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Application December 20, 1937, Serial No. 180,867

8 Claims. (Cl. 158—4)

This invention relates to oil burners of the rotary wall flame type wherein ignition and combustion occur at a combustion region near the combustion chamber wall.

One of the objects of the present invention is to provide a rotary wall flame oil burning device with a combustion producing element of new and improved construction which is of simple design yet is economical to manufacture and capable of causing more efficient combustion.

Another object is to provide a combustion producing element for oil burners of the rotary wall flame type, which is so designed as to insure the breaking up of the oil into fine particles whereby to provide rapid vaporization.

A further object is to provide a combustion ring having an oil vaporizing element which rapidly heats and cools and which includes a fine mesh screen of heat resistant metal.

With the above and other objects in view, the present invention consists in certain features of construction and combinations of parts to be hereinafter described with reference to the accompanying drawings, and then claimed.

In the drawings which illustrate a suitable embodiment of the invention,

Figure 1 is a fragmentary vertical section through an oil burning device of the rotary flame type in which the combustion producing element of the present invention is incorporated, it being taken substantially on line 1—1 of Figure 2.

Figure 2 is a transverse horizontal section taken as looking downwardly toward the combustion producing element;

Figure 3 is an enlarged fragmentary vertical section showing the combustion producing element in greater detail;

Figure 4 is an enlarged vertical section taken on line 4—4 of Figure 2 showing one of the ignition devices in detail; and

Figures 5 and 6 are rear and bottom views, respectively, of the flame deflecting devices, shown in the previous views, showing the oil vaporizing screens mounted thereon, Figure 5 being taken as looking in the direction of the arrows 5—5 of Figure 3.

Referring now to the drawings in which like numerals refer to like parts throughout the several views, the present invention is shown in connection with a furnace 10, equipped with an oil burner of the rotary wall flame type. The oil burner comprises a distributor head 11, driven by an electric motor 12, and having air propelling blades 13 and fuel oil discharge tubes 14. The head 11 is located centrally within the furnace combustion chamber 15, and above a hearth element 16, of suitable refractory, such as metal or ceramic material, extending to the peripheral wall of the combustion chamber 15, so that the oil and air will travel, upon rotation of the head 11, outwardly in a horizontal direction above the hearth element 16 toward a combustion region near the combustion chamber wall.

The improved combustion element of the present invention includes an endless element 17 of ceramic or metallic material having a relatively thin wall 18 extending upwardly from the hearth to a region above the path of discharge of oil from tubes 14 and spaced inwardly from the combustion chamber wall to provide an annular chamber 19 therebetween, and a wall 20 radially inwardly of the wall 18, extending upwardly from the hearth element 16 to provide an air deflecting surface, the upper edge of the wall 20 being below the path of oil discharge, there being a trough or gutter 21 between the walls 18 and 20 for a purpose to be later described. The two walls 18 and 20 may be formed integrally, as illustrated in the drawings, or, if desired, they may be supported separately on the hearth element 16 in spaced relation to form the trough 21.

The combustion element includes in addition to the wall 18 a series of vertically extending fuel intercepting elements 22 disposed radially inwardly of the wall 18 in spaced relation with respect to the surface thereof, as shown in Figure 3. The elements 22 are of relatively fine mesh screen material formed of woven highly heat resistant material, such as chrome-nickel or chrome-steel wire. Although the elements 22 are shown to be spaced from each other, they may be integral and formed from a single strip of mesh material. The elements 22 may be supported in various manners adjacent the inner surface of the wall 18. However, we have shown, for convenience of illustration, a novel manner of supporting these elements by means of which the elements, when separately formed, can be very easily mounted.

We have shown in the various views in combination with the combustion element a series of flame controlling elements 23 which direct the vaporized fuel and air outwardly over the wall 18 toward the combustion chamber wall, and together with the chamber 19, which provides a low pressure area, assist in increasing the speed of combustion and in holding the flame down near the combustion ring.

Each of the flame-controlling elements 23 comprises an imperforate portion 24 disposed

above the upper edge of the wall 18, an imperforate portion 25 extending downwardly from one edge at an angle, as shown in Figure 3, to overhang the trough 21 and the upper edge of the wall 20, and a series of narrow fingers 26 extending outwardly from the other edge thereof to overhang the chamber 19, adjacent fingers extending at upward and downward angles. Secured to the under side of the imperforate portion 24 at the ends thereof are depending strips 27 of metal which are forked at their lower ends as shown at 28. These forked ends fit about the upper edge of the wall to removably support the flame controlling elements 23 above the combustion ring in such manner as to provide a space or passageway 29 between the combustion ring wall 18 and the imperforate portion 24 of the flame controlling element 23.

Each flame intercepting element or screen 22 is supported from a flame controlling element 23 as shown in Figures 3, 5, and 6. The upper edge of element 22 is preferably offset to provide a flange 30 which is secured, preferably, by welding, to the depending strips 27 a substantial distance below the portion 24, and the side edges of element 22 are also formed with flanges 31 which engage with the inner surfaces of the wall 18 to steady the element 22.

It is thus seen that the elements 22 are carried by the flame controlling elements and it is obvious that each flame controlling element can be easily mounted on the wall 18 by sliding the forked ends 28 of the strips 27 over the upper edge of the wall 18 to support the same directly on this wall.

Ignition may be accomplished by any suitable means such as by an electric spark and in this connection we have shown a pair of spark devices 32 disposed substantially opposite to each other. Each spark device 32 comprises electrodes 33 and 34. The electrode 33 is in the form of a block 35 of carbonaceous material molded within an aperture 36, provided in a portion of the wall 18, and about a conductor strip 37 which is secured to a conductor rod 38. The conductor rod 38 extends through the base portion of the wall and within an insulator 38a embedded in the hearth element 16 to a region below the hearth element 16. The electrode 34 is in the form of a conductor rod 39 extending through an insulator 40 to a region below the hearth element 16, the insulator 40 being supported by an inwardly extending extension 41 of the combustion ring as shown in Figure 4. The upper end 42 of the electrode rod 39 extends outwardly over the trough 21 and below portion 25 of the flame controlling element 23 to a position adjacent the screen 22 and in alignment with the electrode block 35 so that when an electric potential is created a spark will pass between the end 42 of the electrode rod 39 and the electrode block 35.

The flame controlling elements 23 may be mounted in endwise spaced relation as shown in Figures 1 and 2, or if desired, they may be in abutting relation.

In the operation of the apparatus described oil and air are thrown outwardly by the rotary head 11 toward the combustion element 17. The fine mesh screen 22 breaks this oil up into minute particles, the greater portion of the same during the initial starting period, passing through the screen and impacting against the inner face of the wall 18 where due to the passage of sparks between the electrodes 33 and 34 the oil is ignited, a portion of the oil collecting in the gutter 21 and burning therefrom. Some of the air passes directly through the screen 22 with the oil, intimately mixing with the finely divided oil particles, and a portion of the air strikes the inner wall 20 where it is deflected in an upward direction toward the screen 22 and wall 18 to create eddy currents, these currents having a rolling action somewhat as shown in Figure 3. Also the air striking the wall 18 is deflected upwardly and by reason of the imperforate portions 24 and 25 of the flame controlling elements 23 is caused by the eddying currents to travel outwardly toward the combustion chamber wall through the spaces or passageways 29 between the imperforate portions 24 of the elements 23 and the upper edge of the wall 18.

Upon ignition of the oil by the electric sparks, the small amount of oil collecting in the gutter on the face of the wall 18 and on the screen burns, heating the wall 18 and very rapidly heating the highly heat conductive screen. When the screen becomes hot, the oil striking the same is vaporized and the gases pass therethrough where they intimately mingle with the eddying currents of air and flow through the passageways 29 and this combustible mixture results in the initiation of a flame adjacent the combustion chamber wall and in the region of the alternating fingers 26 which after the burner is in operation a very short time become highly heated. The wall 18 also becomes highly heated and assists in vaporizing not only the oil impacting the screen 22 but also any of the fine particles of oil which may pass through the screen 22.

The highly heated fingers 26 cause greater turbulence and consequently better mixing and vaporization, which provides for more efficient combustion.

The screen 22, due to the small diameter of the many wires comprising the same, heats extremely rapidly, especially during the initial starting of the burner, and reaches an oil vaporizing temperature a few seconds after the oil is ignited by the ignition device. This provides for the attainment of complete combustion within an extremely short period. Also, the screen cools very rapidly after operation of the burner ceases. Such characteristics are extremely desirable for efficient operation of oil burning devices of the rotary wall flame type.

It is to be clearly understood that the present invention is not limited to the exact construction and arrangement of parts shown, and that various modifications may be made without departing from the spirit and substance of the appended claims.

What we claim is:

1. In combination in an oil burning apparatus having a hearth and means for projecting oil and air across the hearth, a combustion ring of imperforate material extending upwardly from the hearth in the path of fuel projection, and means immediately in front of said ring for finely dividing and vaporing the discharged oil comprising a fine mesh refractory screen of high heat resistance.

2. In combination in an oil burning apparatus having a hearth and means for projecting oil and air across the hearth, a combustion promoting structure comprising a narrow imperforate ring disposed in the path of fuel projection and a fine mesh refractory screen of heat resistant metal in front of and spaced a short distance from said ring for intermingling discharged oil and air, said ring and screen causing rapid vaporization of the oil.

3. In an oil burning device of the wall flame type having a combustion chamber in which oil and air is passed through a portion of the combustion chamber to a combustion region, an oil and air mixing and vaporizing structure disposed at said combustion region in the path of said oil and air comprising an upright narrow wall of refractory material and a refractory metallic screen of fine mesh supported in closely spaced relation in front of said wall, and a flame controlling member supported above said mixing and vaporizing structure in spaced relation thereto, said flame controlling member being of thin refractory material and having an imperforate portion disposed above said mixing and vaporizing structure in spaced relation and projecting in advance thereof for directing the vaporized mixture outwardly over said wall.

4. In combination in an oil burning apparatus having a hearth, means for projecting oil and air across the hearth and an upright oil intercepting wall in the path of the projected oil, a flame controlling member of metal spaced above said wall and supported thereon, and a fine mesh refractory metallic screen supported by said flame controlling member and extending downwardly in front of said wall across the path of the projected oil.

5. In combination in an oil burning apparatus having a hearth, means for projecting oil and air across the hearth and an upright oil intercepting wall in the path of the projected oil, a flame controlling member of metal spaced above said wall and supported thereon, and a fine mesh refractory metallic screen supported by said flame controlling member and extending downwardly in front of said wall across the path of the projected oil and in slightly spaced relation with respect to the oil intercepting surface of said wall.

6. In combination in an oil burning apparatus having a hearth, means for projecting oil and air across the hearth and an upright oil intercepting wall in the path of the projected oil, a flame controlling member of metal spaced above said wall, metallic means supporting said flame control member on said wall, and a metallic screen secured to said metallic means and extending downwardly in front of said wall across the path of the projected oil.

7. In combination in an oil burning apparatus having a hearth, means for projecting oil and air across the hearth and an upright oil intercepting wall in the path of the projected oil, a flame controlling member of metal spaced above said wall, metallic means supporting said flame control member on said wall, and a metallic screen secured to said metallic means and extending downwardly in front of said wall across the path of the projected oil, said screen having edge flange portions engaging said wall to hold the body portion in spaced relation with respect to said wall.

8. In combination with the hearth of an oil burning apparatus and means for projecting oil and air across the hearth to a combustion region near the periphery of said hearth, a combustion promoting structure comprising spaced inner and outer walls above said hearth at said combustion region, the outer wall extending upwardly beyond said inner wall beyond the path of oil projection, and a refractory fine mesh screen in front of said outer wall and rearwardly of said inner wall, said inner and outer walls forming a trough for receiving oil during the starting period of said apparatus and being so disposed with respect to said screen that the oil burning therein will preheat said screen.

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