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BURNER FOR BOILERS AND THE LIKE

Filed Oct. 29, 1958

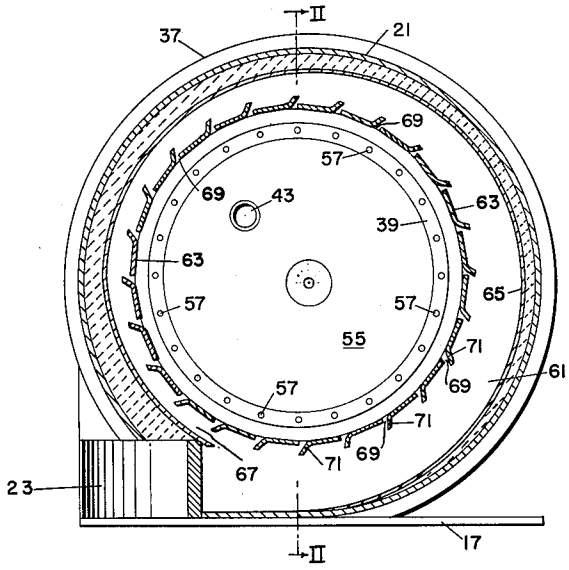

FIG.1.

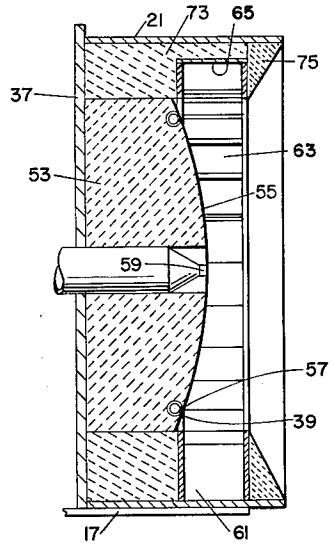

FIG.2.

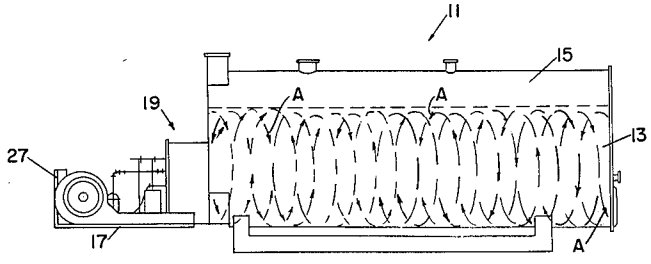

FIG.3.

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BURNER FOR BOILERS AND THE LIKE

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This invention relates to certain new and useful improvements in burners for boilers and the like, and in particular relates to certain new and useful improvements in gas and/or oil fired burner for such usage.

In previous burner installations a great problem has been encountered in obtaining and providing an adequate distribution of heat from the burner to effectively accomplish heating of the boiler or furnace or other similar equipment. This difficulty has led to attempts to boost distribution of the heated air through the utilization of blowers and jet-type arrangements.

These prior attempts to boost the distribution of heat have resulted in a number of difficulties in commercial installation, salient and important among which has been the undue concentration of the heated air at the remote portion of the unit being heated, for example a boiler, the remote end being intended to refer to that end opposite to and remote from the burner. In many instances this heat concentration remote from the burner has resulted in a burning out or serious damage to the firewall of the boiler, necessitating costly and time consuming repairs or replacements. Additionally, the concentration of heat under such a blower or jet blast at the remote end of the boiler or furnace results in an uneven application of the heated air to the length of the surfaces intended to be heated so that for example in a water or steam boiler the heating of the water has initially been accomplished in one concentrated area, necessitating the inefficiency of convection flow to effect distribution of heating throughout the water medium.

Thus in prior practice without a blower or jet boosting its distribution, the heat from the burner has been concentrated at the boiler end proximate to the burner, while with known usages of blower or jet boosters the heat has been concentrated at the remote end of the boiler, each of these concentrations resulting in similar, although perhaps opposite, inefficiencies in the distribution of heat.

The present invention presents an efficient and economical solution to these problems by providing a burner from which the heat of combustion is uniformly distributed in a spiral path under the influence of the present blower and discharge arrangement, with the heated air travelling rapidly along the spiral path, yet advancing longitudinally of the boiler at a moderate rate of speed. Under the arrangement of the present invention, concentration of heat in a single specific area is avoided, substantially eliminating danger of firebox damage, and the spiralled flow is impelled to move outwardly so as to be effectively brought into contact with the inner periphery of the firebox, effecting a uniform and efficient distribution of heat.

It is found that with the use of the present invention heating efficiency is substantially increased over presently known types of installations.

The principal object of the present invention is to provide a new and novel burner means for boilers, furnaces and the like.

A further object of the invention is to provide such a burner means which comprises a fuel-receiving ring for the ignition of fuel, which ring is disposed tranversely of the boiler or furnace unit to be heated.

A further object of the invention is to provide such a device in which the burner means is closely surrounded by the inner wall of a spirally disposed duct of reducing cross section with the inner wall being provided with circumferentially spaced openings and air directional deflectors adjacent the openings.

A further object of the invention is to provide a burner means for a unit to be heated which includes means for impelling the heat produced by a burner into a spiral path flowing closely against the inner periphery of the unit to be heated and spirally advancing longitudinally of the unit to be heated; and

A further object of the invention is generally to improve the design, construction and efficiency of burner means for units to be heated.

The means by which the foregoing and other objects of the present invention are accomplished and the manner of their accomplishment will be readily understood from the following specification upon reference to the accompanying drawings, in which:

FIG. 1 is a cross sectional view of the burner means.

FIG. 2 is a vertical sectional view taken as on the line II—II of FIG. 1.

FIG. 3 is a somewhat schematic side elevational view on a reduced scale of a typical installation including the present invention and illustrative of its use.

Referring now to the drawings in which the various parts are indicated by numerals, the burner means of the present invention are shown as mounted in conjunction with a boiler **11** which includes a firebox or heating chamber **13** and a water chamber **15**, it being understood that the boiler is primarily shown by way of illustration and that a number of conventional type boilers may be utilized in conjunction with the present invention.

The burner means of the present invention are assembled as a unit for attachment to the unit to be heated, such as the boiler **11**. Preferably the burner means are mounted upon a platform **17** and are connected to a suitable opening, not shown, formed in the boiler. At one end of platform **17**, adjacent to boiler **11**, the burner means includes a firing head assembly **19** which is disposed transversely to boiler **11** and communicates directly into chamber **13**. The housing **21** of assembly **19** is connected by a flue or air pipe **23** to an impeller, preferably in the form of a centrifugal fan mounted upon and supported by a platform **17** as a part of the burner means unit. It will be observed that in the preferred embodiment air pipe **23** extends substantially longitudinally along platform **17** away from impeller **25**, and adjacent to its junction with housing **21** air pipe **23** curves inwardly or transversely of the platform in order to effect its communication with housing **21**.

Upon platform **17**, remote from firing head assembly **19** and adjacent to fan **25**, a control panel **27** is mounted, the details of which are substantially conventional and which are not here concerned.

Drive of the impeller fan for forcing air along flue **23** toward housing **19** is accomplished by a suitable motor, preferably mounted upon and carried by platform **17**.

Attached to backing plate **37** is housing **21** of firing head assembly **19**, the housing **21** being preferably of substantially cylindrical shape, and the assembly **19** including housing **21** and backing plate **37** being, as previously stated, supported upon platform **17**. Rigidly fixed to backing plate **37** is a refractory body **53** formed of suitable ceramic material or the like, and which is preferably of substantially circular vertical cross section. As best shown in FIG. 2, body **53** is domed or bulged away from backing plate **37** forming a convex face **55**. Burner ring **39** is embedded in refractory body **53** substantially concentrically therewith and lies closely adjacent to the periphery of body **53**, with the gas discharge apertures **57** being disposed to discharge away from face **55** of refractory body **53**. Gas supply line **29** extends

through refractory body 53 into communication with burner ring 39, and similarly branch pipe 41 to pilot 43 extends through body 53 with the pilot 43 projecting into and through face 55. If desired, a suitable auxiliary fuel nozzle 59 may be mounted in body 53 and project therethrough. Such a nozzle 59 may be connected to a suitable source of supply, not shown, as for example to a supply of oil as a substitute fuel in lieu of the gas supplied to and for burner ring 39.

Within housing 21 a spiral duct 61 is provided, duct 61 surrounding refractory body 53 and burner ring 39 carried thereby. At its lower end, and to one side of housing 21, duct 61 communicates with air pipe 23 providing airflow communication from impeller 25 through flue 23 into duct 61 and thence around body 53 and burner ring 39. Spiral duct 61 includes an inner wall 63 which is disposed substantially concentrically with burner ring 39 and refractory body 53. The duct also includes a spirally disposed outer wall 65 which is positioned at a maximum spacing from inner wall 63 substantially at the junction of duct 61 with flue 23, and progressing, as seen in FIG. 1, in a counterclockwise direction around the burner ring 39, is of a continually reducing cross section reaching its minimum spacing from inner wall 63 closely adjacent to and above the point of communication between duct 61 and flue 23, leaving a re-entry passage 67 for surplus air flowing around and through duct 61 for re-entry thereinto after completing its circuit around the burner ring 39.

Inner wall 63 of duct 61 is provided with a plurality of circumferentially spaced discharge openings 69 communicating the impelled air in duct 61 with the burner ring 39 disposed closely adjacent to inner wall 63. Adjacent each of the discharge openings 69, inner wall 63 is provided with a plurality of angled deflector plates 71, the deflectors being carried by inner wall 63 and projecting outwardly into the interior of duct 61 in order to intercept impelled air passing along duct 61 and to deflect same through an adjacent discharge opening into adjacency with burner ring 39. Duct 61 is surrounded by additional refractory material 73 within housing 21, and outwardly beyond the duct 61 a refractory ring 75 is provided to surround the forward portion of the walls of duct 61. It will be observed that each of openings 69 is closely adjacent to one of the apertures 57 in burner ring 39 so as to direct air flow closely into adjacency with the burner ring apertures.

In the operation of the device, suitable fuel, as for example gas, is fed through pipe 29 into burner ring 39, discharging through apertures 57 in ring 39, and is ignited by the use of pilot 43, thus creating a heating ring which is disposed transversely of the longitudinal extent of boiler 11 and provides a heating at one end of the boiler or other unit to be heated. Impeller 25, activated by starting motor 51, forces or impels a flow of air through flue 23 into duct 61. As the air is forced into duct 61 it begins its spiral pathway within housing 21 and surrounding burner ring 39. As the air is impelled into duct 61, portions of the air so impelled are deflected by deflectors 71 through discharge openings 69 into adjacency with the respective gas apertures 57 of ring 39, creating a spiralling flow of heated air by virtue of the intermingling of the air from the duct with the heat of combustion from the burner ring. This deflected air flow is influenced to flow closely adjacent the periphery of body 53 by convex face 55 and thus is directed toward the inner periphery of housing 21.

The front of the firing assembly unit is, as previously mentioned, open into the interior of boiler 11, and the spiralling air coming from the firing assembly is found to spiral outwardly into close embracement with the inner periphery of the boiler, as indicated by the dotted line arrows A in FIG. 3. The path of the heated air moving away from the firing assembly is a rotating spiral path, leaving a central section which is substantially unaffected, with the heating effect of the travelling air being concentrated against the inner periphery of the boiler.

As a result, while a substantial velocity is imparted to the air flow in virtue of the impelling action of fan 25, this velocity is utilized substantially in the rotary path of flow imparted to the heated air with the result that the advancement of the flow of air from the firing assembly to the remote end of the boiler is held at a relatively low speed. Thus from this operation the distribution of heat is efficiently accomplished without permitting an undue concentration of heat at the remote end of the boiler away from the firing assembly, and at the same time minimizing the possibility of heat concentration adjacent to the firing assembly in virtue of the flow path imparted to the air by the arrangement presently described.

The burner ring 39 is embedded in the refractory body 53 with the discharge apertures 57 communicating toward the forward portion of the firing assembly adjacent convex face 55, and when ignited communicating their heat into the interior of boiler 11. In virtue of the placement of the air discharge openings closely adjacent to and in the direction of air flow forwardly of each of the fuel apertures, a highly efficient and satisfactory arrangement is provided.

It is further found that an efficient air flow is created and maintained, particularly in view of the re-entry space or opening by which surplus air circulated through spiral duct 61 is enabled after its passage around the periphery of inner wall 63 to re-enter the duct 61 and to be further circulated therethrough for distribution. The air in the duct which is of such surplus or excess absorbs heat from the adjacent burner unit and is enabled thus to provide a more efficient flow of heated air for distribution as above described through the longitudinal extent of the boiler or other such unit.

I claim:

1. Burner means comprising a firing head assembly adapted to be mounted at one end of and disposed transversely to a longitudinally extending unit in heating communication with said unit, said assembly including a housing, a spiral duct having a substantially circular inner wall contained in the forward portion of said housing, a substantially circular refractory body mounted in the rear of said housing, said duct inner wall being positioned closely adjacent to the periphery of said body and extending forwardly from said body, said spiral duct including a spiral outer wall extending around said inner wall from a maximum spacing away from said inner wall at the beginning end of said spiral wall to a minimum spacing from said inner wall at the terminal end of said spiral wall, the cross sectional area of said duct gradually reducing from end to end of said duct, air impeller means communicated with said duct adjacent said beginning end to create air flow through said duct from end to end, air flowing beyond said terminal end re-entering said duct adjacent to said beginning end, a plurality of slot-like fore-and-aft extending air discharge openings through said inner wall, a like plurality of deflectors projecting away from said inner wall into said duct respectively adjacent and coextensive in fore-and-aft length with said openings, said openings and deflectors being respectively positioned to discharge deflected air around and forwardly of the periphery of said body, a burner ring mounted in said body adjacent the periphery of said body and including a plurality of closely spaced, forwardly directed burner ports, positioned respectively adjacent the rearward ends of said air discharge openings, said body including a forwardly bulging convex face forming the forward part of said body and extending throughout the limits of the periphery of said body, said face extending forwardly beyond said burner ports and at its forwardmost central extent extending substantially forwardly beyond the rearward ends of said openings, and projecting into the spiral path of said deflected air, said deflected air discharged within said inner wall passing closely adjacent said burner ports and impinging against said face and

being confined by said face to flow closely against the inner periphery of said housing means and produce a substantially spiral air flow path within said housing, said reducing cross sectional area of said duct maintaining substantially uniform pressure and velocity in said air flow from end to end of said duct.

2. Burner means comprising a firing head assembly adapted to be mounted at one end of and disposed transversely to a longitudinally extending unit in heating communication with said unit, said assembly including a housing, a spiral duct having a substantially circular inner wall contained in the forward portion of said housing, a substantially circular refractory body mounted in the rear of said housing, said duct inner wall being positioned closely adjacent to the periphery of said body and extending forwardly from said body, said spiral duct including an outer wall extending around said inner wall, air impeller means communicated with said duct to create air flow through said duct from end to end, air flowing beyond the terminal end of said duct re-entering said duct adjacent to the end thereof, a plurality of slot-like fore-and-aft extending air discharge openings through said inner wall, a like plurality of deflectors projecting away from said inner wall into said duct respectively adjacent and coextensive in fore-and-aft length with said openings, said openings and deflectors being respectively positioned to discharge deflected air around and forwardly of the periphery of said body, a burner ring mounted in said body adjacent the periphery of said body and including a plurality of closely spaced, forwardly directed burner ports, positioned respectively adjacent the rearward ends of said air discharge openings, said body including a forwardly bulging convex face forming the forward part of said body and extending throughout the limits of the periphery of said body, said face extending forwardly beyond said burner ports and at its forwardmost central extent extending substantially forwardly beyond the rearward ends of said openings, said deflected air discharged within said inner wall passing closely adjacent said burner ports and impinging against said face and being confined by said face to flow closely against the inner periphery of said housing means and produce a substantially spiral air flow path within said housing.

3. Burner means comprising a firing head assembly adapted to be mounted at one end of and disposed transversely to a longitudinally extending unit in heating communication with said unit, said assembly including a housing, a spiral duct having a substantially circular inner wall contained in the forward portion of said housing, a substantially circular refractory body mounted in the rear of said housing, said duct inner wall being positioned closely adjacent to the periphery of said body and extending forwardly from said body, said spiral duct including an outer wall extending around said inner wall, air impeller means communicated with said duct to create air flow through said duct from end to end, air flowing beyond the terminal end of said duct re-entering said duct adjacent to the beginning end thereof, a plurality of slot-like fore-and-aft extending air discharge openings through said inner wall, said openings being respectively positioned to discharge deflected air around and forwardly of the periphery of said body, a burner ring mounted in said body adjacent the periphery of said body and including a plurality of closely spaced, forwardly directed burner ports, positioned respectively adjacent the rearward ends of said air discharge openings, said body including a forwardly bulging convex face forming the forward part of said body and extending throughout the limits of the periphery of said body, said face extending forwardly beyond said burner ports and at its forwardmost central extent extending substantially forwardly beyond the rearward ends of said openings, said deflected air discharged within said inner wall passing closely adjacent said burner ports and impinging against said face and being confined by said face to flow closely against the inner periphery of said housing means and produce a substantially spiral air flow path within said housing.

References Cited in the file of this patent

UNITED STATES PATENTS

1,656,907	Bansen	Jan. 24, 1928
2,138,246	Sorg	Nov. 29, 1938
2,215,079	Hess	Sept. 17, 1940
2,413,586	Skoog	Dec. 31, 1946
2,684,711	Du Fault	July 27, 1954
2,878,104	Reed	Mar. 17, 1959

FOREIGN PATENTS

265,041	Great Britain	Feb. 3, 1927