July 14, 1931. D. S. JACOBUS ET AL 1,814,555

FURNACE

Filed Nov. 10, 1927

Fig 1

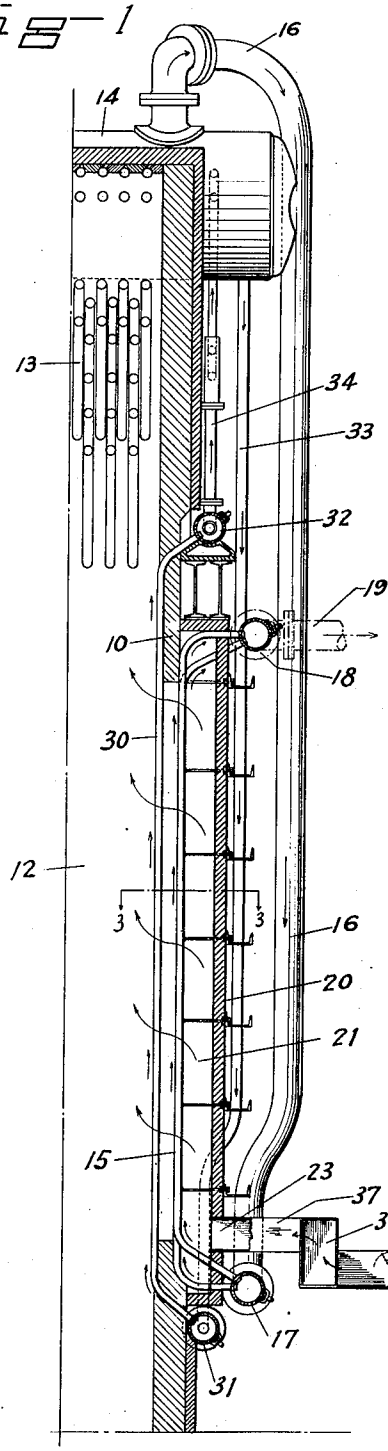


Fig 3

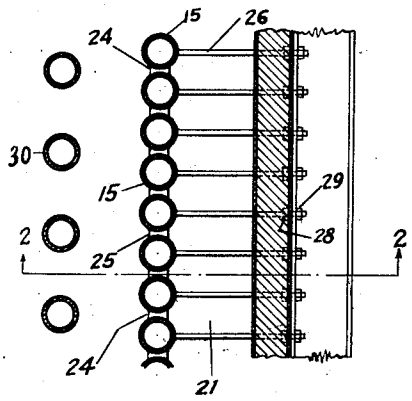
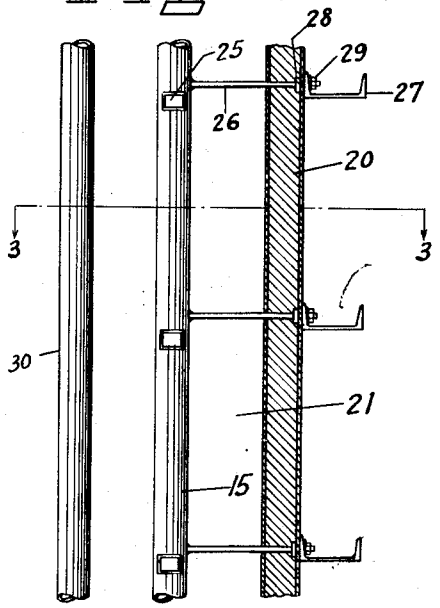


Fig 2



INVENTORS
David S. Jacobus and
BY Howard J. Kerr
Gifford & Faulkner
ATTORNEYS

Patented July 14, 1931

1,814,555

UNITED STATES PATENT OFFICE

DAVID S. JACOBUS, OF MONTCLAIR, AND HOWARD J. KERR, OF WESTFIELD, NEW JERSEY, ASSIGNORS TO THE BABCOCK & WILCOX COMPANY, OF BAYONNE, NEW JERSEY, A CORPORATION OF NEW JERSEY

FURNACE

Application filed November 10, 1927. Serial No. 232,240.

This invention relates to a novel and improved arrangement of a radiant heat superheater whereby the superheat may be regulated and also whereby the tubes of the superheater may be effectively protected against accumulations of slag and the like, particles of which are carried in furnace gases. The invention will be understood from the following description in connection with the accompanying drawings, in which we have shown a selected embodiment of our invention, and in which:—

Fig. 1 is a vertical sectional view through a portion of a furnace having our invention installed therein.

Fig. 2 is a fragmentary view of a portion of the structure appearing in Fig. 1, but drawn on a large scale, this view being taken on the line 2—2 of Fig. 3.

Fig. 3 is a section taken on the line 3—3 of Figs. 1 and 2.

In the embodiment illustrated, the numeral 10 designates a wall of a furnace having a combustion space 12, above which is disposed the boiler comprising the usual tubes 13 and the steam and water drum 14. Disposed in an opening in the wall 10 is a superheater comprising a plurality of tubes 15, through which the steam may circulate from the drum 14, this steam passing through the connection 16 into the header 17, and thence through the tubes 14, into the outlet header 18, to a steam main, or the like, 19.

It will be seen that the tubes 15 will be exposed to direct radiant heat from the fire, which will occupy the usual position in the combustion space 12. However, the gases rising from the fire contain more or less slag, or the like, which would rapidly form a deposit upon the tubes unless means were provided to avoid this action. Such means will now be described.

Spaced from the row of tubes 15 is a wall 20 which, with the tubes 15, forms a chamber 21 through which air or other gas may pass. For the purposes of illustration, we have shown a pump 22 which may be used to force air or waste gases through the chamber 21, and this pump may be connected to a suitable source of waste gases, or may be used to supply air. In either case, the gas forced into the chamber by the pump is preferably heated. This gas is then forced into the chamber 21, through one or more openings 23 in the wall 20, and passes upwardly into the chamber and out into the furnace.

Referring particularly to Fig. 3, it will be seen that the tubes 15 are relatively close together, preferably being spaced a distance apart less than the diameter of a tube. The result is that the space 24 between any two tubes forms a relatively narrow passage for the gas in the chamber, so that the gas in passing between the tubes will do so at increased velocity, and thus prevent the accumulation of slag, or other particles, on the tubes. The tubes may be held in spaced relation by means of suitable spacers 25, which are preferably hollow metallic members welded at one end to one tube and slidably contacting with an adjoining tube. By this means, the tubes are held in properly spaced relation, but room for relative longitudinal movement therebetween is provided, so that this movement may freely take place during expansion and contraction of the tubes. A certain amount of relative lateral movement is also possible, without materially altering the spacing of the tubes.

The superheater tubes 15 are also secured to the wall 20 by means of flexible connections 26 which pass through the wall and are secured to the channels 27. These connections 26 may be welded or otherwise secured to the tubes. This arrangement provides means whereby the connections can resist both tensile and compressive stresses, it being noted that in the form shown, each connection has nuts 28 and 29 disposed on opposite faces of the flange of the channel to which it is secured. The wall 20 is held in place by the channels 27, thus forming a construction having the required strength. By this means and through the use of the spacers 25 the superheater tubes are held in alignment at certain points spaced along their length and prevented from being warped out of shape to an extent that would lead to trouble. This construction allows the tubes

to expand and contract freely on heating or cooling.

In order to reduce to some extent the amount of radiant heat falling on the tubes 15, it is preferable in some cases to dispose a line of water tubes 30 between the tubes 15 and the fire, these tubes 30 being connected to inlet and outlet drums 31 and 32, respectively, which are, in turn, connected to the boiler 14 by suitable pipes 33 and 34, respectively. By this arrangement, the water tubes are not only heated to aid in forming steam, but they also form a relatively cool zone in front of the superheater tubes 15. Moreover, the tubes 30 in themselves also act as baffles to intersect a certain amount of the radiant heat and thus protect the tubes 15 from excessive heat.

In operation a suitable gas is forced into the chamber 21 by means of the pump 22. It will be noted that this chamber is entirely closed except for the spaces 24 between the tubes 15, and, therefore, the only outlet for the gas is into the furnace. The flow of gas may be controlled by any suitable means, exemplified by a damper 35 in the pipe leading from the pump 22 to the header 36, from which extend laterals 37 to the openings 23, or it may be regulated by varying the speed of the fan. The gas entering the chamber 21 is relatively cool as compared with the temperature in the furnace, and by regulating the amount of this gas the degree of superheat may be effectively controlled. The velocity of the gas entering the chamber may also be varied, as by the damper 35, to effectively maintain the tubes 15 clear of slag deposits.

Another advantage secured in circulating air or gas over the radiant heat superheater tubes in the way described is that the temperature of the tubes is reduced below what it would be with no air or gas circulated over the tubes. Where the line of water tubes 30 is not installed in front of the superheater tubes it is advantageous in some cases to install enough heating surface in the radiant heat superheater tubes to allow for a material amount of cooling by the air or gas when the superheater is supplying the desired amount of superheat. This will make it possible to use the radiant heat superheater under furnace conditions that would give trouble through burning the tubes if not so cooled. The walls of the superheater tubes are made of a sufficient thickness to conduct enough heat from the furnace side of the tubes to the rear of the tubes to avoid overheating the tubes on the furnace side.

It will be obvious that various changes and modifications may be made in the selected embodiment by those skilled in the art, without departing from the spirit of the invention and, therefore, we do not intend to limit ourselves except by the appended claims.

We claim:—

1. In combination, a row of superheater tubes disposed closely together but with narrow spaces therebetween, said row having one side thereof subjected to the heat of a furnace chamber, means on the other side of said row forming a gas chamber, and means for supplying gas under pressure to said gas chamber.

2. In combination, a row of superheater tubes disposed closely together but with narrow spaces therebetween, said row having one side thereof subjected to the heat of a furnace chamber, and means to discharge a cooling gas through said spaces into said chamber.

DAVID S. JACOBUS.
HOWARD J. KERR.