

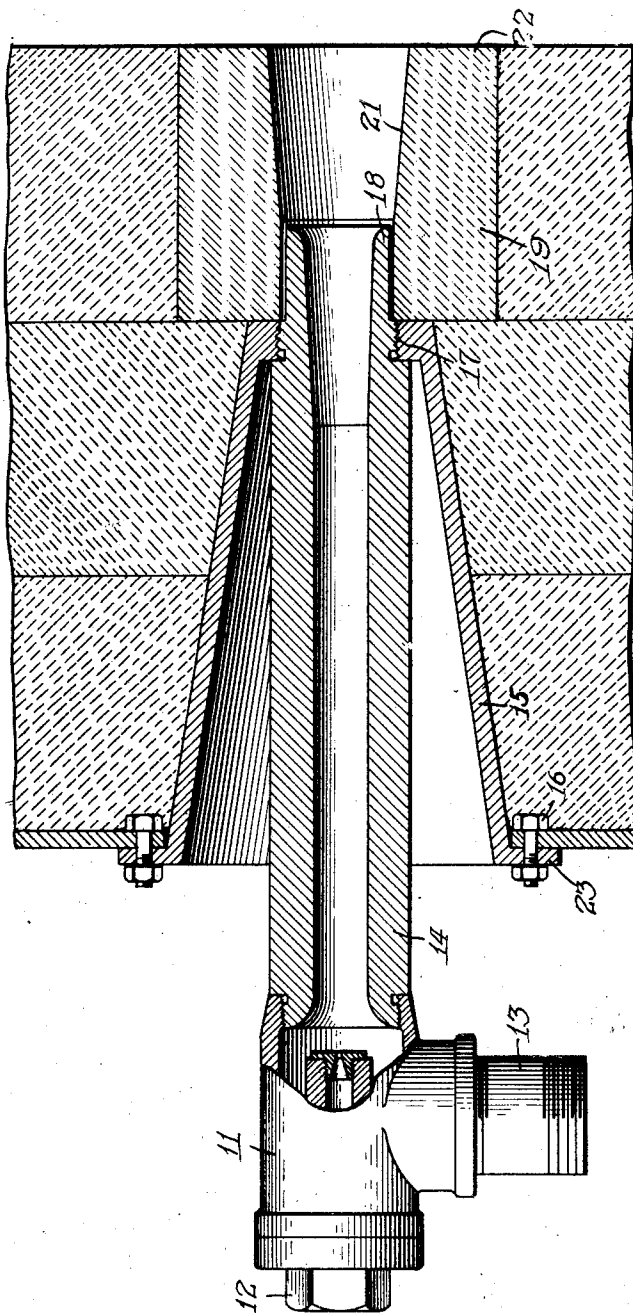
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COOLING WELL FOR BURNERS

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Witness:

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COOLING WELL FOR BURNERS

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This invention relates in general to fuel burning devices and in particular to the manner of mounting them in furnace walls in such a way as to protect them from the disastrous effects of high furnace temperatures.

In the past, various devices have been resorted to for introducing a combustible mixture through the wall of a furnace in which it is desired to maintain extremely high temperatures for heat treating operations, the problem being to efficiently introduce the mixture at the right point and yet protect the burner from the heat which exists in the combustion chamber. Though the extremity of the tuyère may be protected from reflected heat by concealing it within the fire brick, yet the main body of the tuyère will be highly heated nevertheless due to the heat carried back to it by the refractory walls of the combustion chamber. This heat will unavoidably reach the tuyère, but it need not be allowed to accumulate and remain in the wall of the tuyère. This invention aims to protect the mixing device and tuyère from radiated heat and to carry away from the tuyère whatever heat has been absorbed by the tuyère.

One of the objects of this invention, therefore, is to provide a fuel burning device which may be adapted to a furnace in such a way as to protect the device efficiently from the high temperatures produced within the furnace.

Another one of the objects of this invention is to provide a fuel mixing device and tuyère which may be attached to a furnace wall securely but will have only a relatively small portion of the tuyère in contact with the highly heated part of the furnace wall to thus minimize the amount of heat conducted to it by the furnace wall.

Another object of this invention is to provide a fuel mixing device and means for attaching it to a furnace in such a way as to eliminate harmful effects from heat which is necessarily absorbed by the device.

Another object of the invention is to provide a means for cooling a fuel mixer which is receiving heat from the furnace wall into which it extends.

Other objects, advantages and capabilities are inherently possessed by this invention and will later more fully appear.

Referring now to the drawing, the figure shows partially in section the fuel mixing device and the manner of attaching it to the furnace to accomplish the above and other desired results. Various types of mixers may be used with this invention, the one shown being illustrative only. The mixer generally indicated as 11 having a gas inlet 12 takes air in through the passage 13 and mixes it with the gas in the tuyère 14. A cooling well generally indicated as 15 is secured to the outer wall of the furnace by bolts 16 and at its inner end by means of threads 17 supports the tuyère. A reduced portion 18 of the tuyère then extends into the refractory wall 19 of the furnace and terminates within the passage 21. The combustible mixture produced by the mixer is projected through the tuyère and through the passage 21 into the combustion chamber.

By terminating the tuyère a substantial distance back from the surface 22 of the combustion chamber, the extremity of the tuyère is well protected from heat radiated by the walls of the combustion chamber but a considerable amount of heat will, of course, be carried back through the refractory wall 19 by conduction. The amount of heat which may be transmitted from this wall into the tuyère is minimized by the relatively small portion of the tuyère which is in proximity to the refractory material. It is apparent that if a long portion of the tuyère contacted with or were in proximity to the refractory material, the tuyère, if made of metal, would rapidly deteriorate and eventually be no longer serviceable. It is extremely important to maintain these fuel burning devices in serviceable condition as the shut-down cost when changing burners is frequently unfortunately large.

The heat which is necessarily absorbed by the reduced portion of the tuyère is quickly conducted to the thick portion of the outer end of the tuyère and is free then to radiate into the surrounding air which fills the cooling well 15. Another portion of this ab-

sorbed heat is taken through the threaded engagement of the cooling well and the tuyère and conducted along the walls of the cooling well, from which walls it is easily radiated into the surrounding atmosphere. While cooling wells of various shapes may be employed, the one illustrated is found to be very serviceable and it is particularly noted that the upwardly and outwardly slanting top wall of the well is naturally suited to an upward and outward flow of heated air.

Another advantage pertaining to this device is that the flange 23 on the cooling well firmly contacts with a large portion of the outer furnace wall and forms a very rigid mounting for the burner and tuyère without placing any strain upon the refractory lining of the combustion chamber. As shown in the illustration, there need not be any intimate contact between the reduced portion of the tuyère and the refractory lining of the passage. A slight separation at this point will reduce the conduction of heat from the brick to the tuyère and also relieves the brick from the effect of the expansion of the metal.

Another advantage pertaining to this device is observed when it becomes necessary to renew the refractory lining of the combustion chamber. It will be seen that this can be accomplished easily without disturbing the burner since the burner does not rely for its support on the refractory lining. Also the wall of the furnace into which the cooling well extends is partially supported upon the cooling well itself, thus making it possible to use both solid and powdered forms of insulating material adjacent to the burner. Whatever heat may be conducted through the walls of the furnace directly to the cooling well itself is, of course, easily radiated to the atmosphere in the cooling well.

The manner of mounting the tuyère in the cooling well with a short portion of the tuyère extending into the refractory brick makes it easy to remove the tuyère from the furnace without disturbing the lining of the furnace. When the tuyère is in operative position, the opening through which it extends is perfectly sealed thus preventing the ingress of air which in certain operations would be very undesirable and at all times preventing the egress of the heated products of combustion.

It should be understood that the disclosure is a preferred embodiment of the invention selected for the purpose of illustration, and that various modifications and changes may be made without departing from the spirit and scope of this invention.

Having shown and described this invention, I claim:

1. In combination with a wall having a

passage therethrough for delivery of a fuel mixture, an open ended cooling well extended into said passage, a shoulder in the passage abutting and covering the entire inner end surface of the well, a reduced portion of the passage extending from said shoulder away from the well to the delivery side of the wall, and a fuel delivery tube extending through the well into the reduced passage terminating short of the delivery side of the wall and having sealing detachable engagement with the inner end portion of the well for conducting heat from the tube to the well, the tube and its engagement with the inner end of the well being adapted to seal the interior of the well apart from the atmosphere in said reduced portion of the passage.

2. In combination with a wall having a passage therethrough, a cooling well secured to one surface of the wall and extending into said passage a distance substantially less than the length of the passage, and a fuel delivery tube interlockingly engaged with and sealing the inner end of the well and protruding therethrough, said tube being supported by the well and extending beyond the well into the wall but terminating short of the wall surface toward which it extends and a shoulder in the passage abutting the inner end surface of the well cooperating with the tube to shield the well from heat rays reflected and radiated back into the delivery end of the passage.

3. In combination with a wall having a passage for the delivery of a fuel mixture, a fuel delivery tube extending into the passage and terminating therein short of the delivery side of the wall, and means for shielding all but a short portion of the forward end of the tube from heat rays which may be reflected back toward the tube through the delivery end of the passage, said means being adapted to conduct heat from unshielded portions of the tube away from the rear portion of the tube and to radiate said heat into the atmosphere.

4. In combination with a wall having a passage therethrough, a circumferential shoulder in said passage, a cooling well in said passage and having ports at both ends, one of said ends abutting said shoulder, said passage having a reduced diameter adjacent said shoulder, the port at the inner end of the well having as great a diameter as that of said reduced portion of the passage, a fuel delivery tube interlockingly engaged with and supported on said well at said inner port, said tube extending through both ends of said well from beyond one surface of the wall but terminating within the wall short of the opposite wall surface, the tube and its engagement with the well being adapted to seal the interior of the well apart from the passage lying beyond the inner end port of the well.

5. In combination with a wall having a passage therethrough, a cooling well extending into said passage, said well having a port in each end, the port at the inner end of the well registering with a reduced portion of the passage of substantially the same diameter as the port, and a fuel delivery tube extending through both ports of the well having a detachable engagement with the inner end port of the well forming substantial area of contact for transfer of heat from the tube to the inner end of the cooling well, the tube terminating short of one surface of the wall the reduced portion of the passage and the tube being adapted to shield the inner end of the well from heat reflected and radiated back toward the well from beyond the delivery side of the wall, the tube and its engagement with the well being adapted to seal the interior of the well apart from the delivery side of the wall.
6. In combination with a wall having a passage therethrough for delivery of a fuel mixture, a cooling well secured to the outer surface of the wall extending into the passage part way toward the delivery side of the wall, the passage being adapted to shield the inner end of the well from heat rays reflected back through the passage from the delivery side of the wall, and a fuel delivery tube extending through the well from the outer side of the wall terminating beyond the well within said passage a substantial distance short of the delivery side of the wall, said tube being intimately engaged with the inner end of the well to seal the interior of the well apart from the delivery end of said passage and to effect heat transfer from the tube to the well.
7. In combination with a wall having a passage therethrough, a cooling well extending into said passage, said well having a port in each end, the port at the inner end of the well registering with a reduced portion of the passage and having a diameter at least as great as the diameter of said portion, and a fuel delivery tube extending through both ports of the well having a sealing and interlocking contact with the inner end portion of the cooling well, the tube terminating short of one surface of the wall.
8. In combination with a wall, an open ended metallic cooling well extending from one surface of the wall into the wall part way toward the opposite surface thereof, said wall having a refractory lined passage registering with the port in the inner open end of said well, and a fuel delivery tube extending through both ends of the well and having one end terminating in said refractory lined passage, the tube having intimate sealing contact with the inner end of said well sealing the interior of the well apart from the delivery side of the wall.
9. In combination with a wall having a passage therein, a cooling well extending into the wall from one side, the outer end of the well being of substantially greater cross section than the inner end and being open to the atmosphere at that side of the wall, the inner end of the well having a port there-through registering with one end of said passage, said passage extending from said port to the delivery side of said wall, and a fuel mixing tube extending into the well from the larger end thereof and protruding through said port into said passage, the tube being detachably engaged with said well and supported thereon by threaded engagement with the internal margin of said port, the well and the tube and their said engagement at said port being constructed to seal the interior of the well from the delivery side of said wall, the inner extremity of the well being shielded by the wall of said passage and by said tube from heat reflected and radiated back toward the well from beyond the delivery side of said wall, the engagement of the tube and well being adapted for conducting heat from the walls of the tube into the inner end of said well.
- In witness of the foregoing I affix my signature.
- GARNET W. McKEE.