UNITED STATES PATENT OFFICE.

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SMOKE-CONSUMING APPARATUS FOR BOILER-FURNACES.

1,135,275.


To all whom it may concern:

Be it known that I, FARDINAND GAREAU, a subject of the King of Great Britain, and resident of the city of Montreal, in the Province of Quebec, in the Dominion of Canada, have invented certain new and useful Improvements in Smoke-Consuming Apparatus for Boiler-Furnaces; and I do hereby declare that the following is a full, clear, and exact description of the same.

The invention relates to a smoke consuming apparatus for steam boiler furnaces and the object of the invention is to provide automatic devices for supplying jets of steam and the forced draft for the complete consumption of smoke in the furnace.

In the apparatus according to this invention, the steam is turned on to a specially arranged set of jets in the furnace through a single lever which is preferably the furnace door itself such devices being provided to maintain the steam supply for a short time after the furnace door has been reclosed or as long as the furnace door is open.

A further feature is a rising and falling bridge damper adapted to close the space between the top of the bridge and the boiler in order to partially confine the combustion within the fire box, while the steam is supplied to assist in the consumption of said products.

The invention will be better understood with the aid of the accompanying drawings in which—

Figure 1 is a perspective view of a portion of a boiler and furnace with the walls broken away to more clearly disclose the fire box and the steam jet apparatus therein.

Fig. 2 is an elevation of the bridge damper and its operating cylinder with the walls of the furnace and boiler in dotted lines. Fig. 3 is a perspective view of that part of the steam jet apparatus within the fire box showing one corner broken away to more clearly disclose its construction.

Fig. 4 is a sectional plan view of one of the front jets forming part of the apparatus shown in Fig. 2. Fig. 5 is a sectional perspective view of the fire door. Fig. 6 is a side elevation of the steam blower for the forced draft and Fig. 7 is a front end view of the blower shown in Fig. 6.

Like numerals of reference indicate corresponding parts in each figure.

Referring to the drawings, 1 indicates a steam boiler of any usual and well known form of construction supported within the side walls 2 and 3, front wall 4 and a rear wall (not shown) a fire box being provided 60 by a bridge wall 5 and grate 6. In the front wall is provided the fire door 7 while the ashpit 8 is provided with doors 9. Leading into one side of the ash pit is an opening 10 through the side wall 3 preferably circular in form and through which air is injected to supply a draft beneath the grate 6.

11 is the steam blower formed of crosses 12 connected by nipples 13, said crosses having bent pipes 14 extending oppositely therefrom and each cross being arranged at a different angle to the adjacent cross so that the outer end of each of said inwardly bent pipes 14 touches a different point in the circumference of a circle of which the nipples and crosses form the axis. The inner end of each of the bent pipes 14 is converged as indicated at 15 in order that any grit passing with the steam will not readily enter the said bent pipes. The outer ends of said bent pipes are closed with plugs 16 having small steam outlet orifices 17. The front end nipple 13 is also provided with one of these plugs 16 and it will thus be seen that steam passing through the pipes 18 into the blower passes through the orifices 17 in a number of parallel jets within the opening 10 thus drawing a current of air through said opening. The air and steam thus driven inwardly beneath the grate become intimately mixed and act together to create a forced draft and also to supply the base of the fire with a mixture which greatly assists in the more complete combustion of the fuel.

Above the grate in the form of a rectangular ring is the steam jet apparatus 19 preferably built up entirely of tees, elbows and connecting nipples and pipes and comprising an outer casing 20 forming a water jacket and in which is contained a steam pipe 21 running completely around said ring. At the forward end of the steam jet apparatus, that is to say, the part running across the front of the furnace just above the fire door the steam pipe 21 is provided with forwardly and downwardly extending branches 22 surrounded by the tubes 23 to maintain the water jacket, said tubes 23 being closed by caps 24 while the branches 22
are closed by caps 25 having steam outlet orifices 27. The inner ends of the branches 22 are converged and extend a little into the pipe 21 so as to prevent any grit in the steam blowing into said branches. Steam is supplied to the pipe 21 by a steam supply pipe 28 running through the water jacket 20 and connected to said pipe 21.

Water circulating pipes 29 and 30 are connected to the water jacket 20 at any suitable point in the ring; also at the outer ends of the sides of said ring there are arranged a pair of upwardly projecting pipes 31 leading through the water jacket from the pipe 21 and having inwardly projecting jets 32 designed to throw steam into part of the fire box above the fire and adjacent to the sides of the boiler. Similarly, steam pipes 33 extend downwardly through the water jacket 20 from the pipe 21 one on each side of the ring, but preferably not opposite; the said pipes 33 having inwardly projecting jets 34 designed to throw steam laterally into the fire.

The bridge wall 5 has an upwardly inclined draft hole 35 extending almost completely thereacross near its upper end and into each end of this hole a jet 36 is disposed, to which steam is supplied through the pipes 37 leading through the water jacket 20 from the steam pipe 21, said jets being for the purpose of directing steam into such products of combustion as pass through said hole 35.

The bridge damper 38 is in the form of a plate extending right across the fire box between the side walls 2 and 3 and are shaped at its upper edge to fit around the boiler, said damper being adapted to slide vertically in a corresponding slot in the bridge wall and having a piston rod 39 secured to its lower edge and connected to a piston which reciprocates in a stationary cylinder 40 disposed within the bridge wall in a hole 41 therethrough closed by suitable doors. A fluid supply pipe 42 leads through the furnace walls to the lower end of said cylinder 42 in order that fluid may press its piston up to raise the damper as hereinafter more fully described. When the damper is raised, a hole 43 therein comes into alignment with the bridge wall hole 45 so that there will only be this comparatively small outlet from the fire box when the bridge damper is raised.

It hardly necessary to state that the above mentioned steam jets are in greatest need of greatest value during the feeding of the furnace and for this reason means are provided as hereinafter disclosed for automatically admitting steam to the jet apparatus and forced draft apparatus and for simultaneously raising the bridge damper to partially confine the products of combustion within the fire box whenever the fire door 7 is opened, and means for shutting off the steam and dropping the damper at a certain period after the said door has been closed. Such automatic means are clearly shown in Fig. 1 and, referring to said figure, 70 44 indicates a small cylinder in which is reciprocally disposed a piston 45 provided with oppositely extended piston rods 46 and 47 gliding freely through the ends of the cylinder. The upper end of this cylinder is provided with an inlet port adapted to receive the end of a pipe 48 through which fluid (preferably water) under pressure may be delivered to the cylinder. Directly opposite this inlet port is an exhaust or outlet port to which is connected the exhaust pipe 49.

Through the pipe 49 the fluid is exhausted from the cylinder. A coil spring 50 arranged between the piston 45 and the bottom of the cylinder, acts to return the piston toward the upper end of the cylinder. The flow of fluid under pressure through the pipe 48 is controlled by turn plugs 51 and 52, the latter of which is flexibly connected to the fire door 7 by a link 53 so that the opening of the door will cause the opening of the plug valve 52 and the closing of the door will effect the closing of the valve, with resulting admission and exclusion of the pressure fluid to and from the pipe 48.

The handle of the turn plug 51 is flexibly connected to the piston rod 47 by a lever 54 and a link 55 so arranged that the plug valve 51 will be maintained in open position while the piston 45 is in a raised or normal position as shown in Fig. 1. The exhaust pipe 49 is provided with a turn plug 56 flexibly connected to the piston rod 46 by a lever 57 and a link 58 similar to the connections between the plug 51 and the piston rod 47. These connections are so arranged that the turn plug 56 is turned to the closed position when the parts are in the position shown in Fig. 1, and the open position when the piston 45 is moved to the lower end of the cylinder. The result of this construction is that the turn plug 56 will be closed to prevent exhaust during the time that the turn plug 51 is opened to admit the fluid under pressure, and vice versa. Also the turn plug 52 will be closed to prevent further admission of fluid pressure after the door 21 has been closed, but the action of the spring 50 in returning the piston 46 and forcing out the fluid from above the steam is only gradual because of the retarding action of the fluid. This slow return of the piston toward the upper end of its cylinder is made use of to continue the injection of steam. For this purpose the steam feed pipe 59 delivering steam from the steam dome to the supply device 28 and 18 is provided with a turn plug 60 for controlling the passing of steam therethrough. The handle of this plug is flexibly connected...
to one end of the lever 57, the movement of which effects the operation of said plug, the slow retarded upward movement of the piston 45 causing through the lever 57 a slow and gradual closing of the turn plug 60, so that the passage of steam to the pipes 28 and 18 is not entirely cut off until a considerable time after the fire door 7 has been closed.

Either or both of the supply pipes 28 and 18 may be provided with turncocks so that they may be separately and independently cut off, if desired.

In order that the bridge damper 38 may be raised during the time that steam is injected on to the fire, the supply pipe 42 to the cylinder 40 is brought around to the front of the furnace and connected with the fluid supply pipe 48 to the cylinder 44 and a three way valve 61 is connected therein at a point beyond its junction with the pipe 48, said valve being opened and closed simultaneously with the valve plug 52 by an extension of the link 53. In the position shown in the drawings both the valves 52 and 61 are closed, but the valve 61 is connected by a branch 62 to the exhaust pipe 49 so that after the fire door is closed, the weight of the damper brings the piston of the cylinder 40 down and gradually forces out the fluid through the pipe 42 into the exhaust pipe 49 so that by the time the steam supply is cut off the bridge will be in its down position.

The door 7 is provided with an opening adapted to be closed by a removable plate 63. About this opening and to the rear of the door is solidly bolted or otherwise secured an air heating chamber or box 64 provided with a perforated back 65. Should it be desired to admit air to the fire box directly above the fire on the grate, the plate 65 will be removed and cold air will be drawn in through this chamber. The chamber, of course, is highly heated by being inside of the furnace. Consequently, air passing to the interior of this box is heated therein so that it will not cool the fire too suddenly. The perforated back 65 also acts to retard the inflow of the air so that it may be heated to a higher temperature before coming in touch with the fire.

It is thought that the operation and use of the invention will be clear from the preceding detailed description.

Changes may be made in the construction, arrangement, and disposition of the several parts of the invention without in any way departing from the field and scope of the same, and it is meant to include all such within this application wherein only a preferred form has been disclosed.

What I claim is:

1. In a smoke consuming apparatus for boiler furnaces, the combination with the furnace walls, fire box and bridge, the latter having a hole therethrough, of a rising and falling damper adapted to open and close the space between the boiler and top of the bridge, said damper having a hole therein adapted to coincide with the aforesaid bridge hole when in the raised position and means for simultaneously supplying steam into the fire box and into said bridge wall hole.

2. In a smoke consuming apparatus for boiler furnaces, the combination with the furnace walls, fire box and bridge the latter having a hole therethrough, of a steam ring within the fire box adapted to throw jets of steam on to the fire, means for supplying steam to said ring, a rising and falling damper adapted to open and close the space between the boiler and top of the bridge and means for raising and lowering said damper, said damper having a hole therein adapted to coincide with the aforesaid hole through the bridge wall when the damper is raised and jets forming extensions from the steam ring adapted to throw steam into said bridge wall hole.

Signed at Montreal, Quebec, Canada, this 9th day of December, 1913.

FARDINAND GAREAU.

Witnesses:
M. Patenaude,
C. Patenaude.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."