H. A. POPPENHUSEN.

TRAVELING GRATE FURNACE.

APPLICATION FILED JUNE 3, 1911.

1,003,503.

Patented Sept. 19, 1911.

3 SHEETS—SHEET 1.

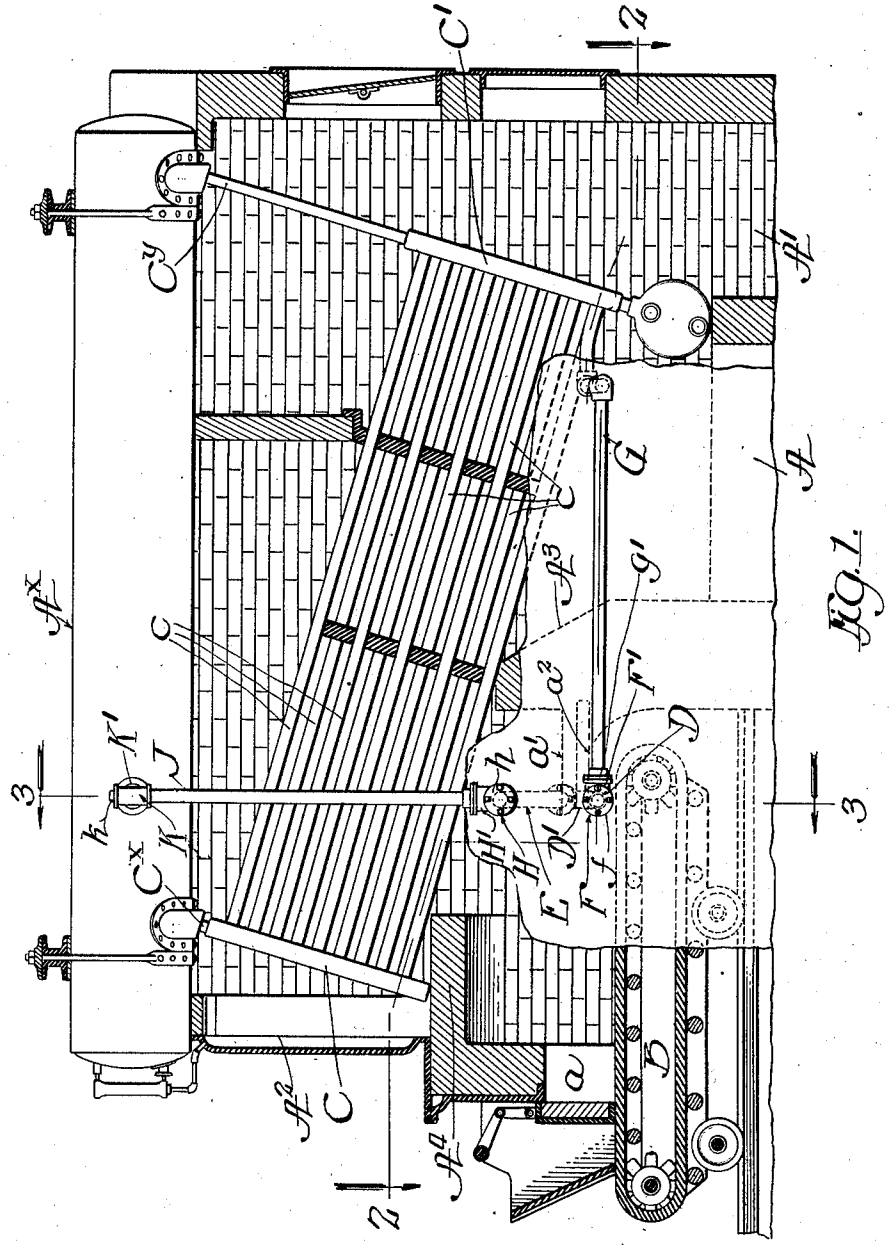

Fig. 1.

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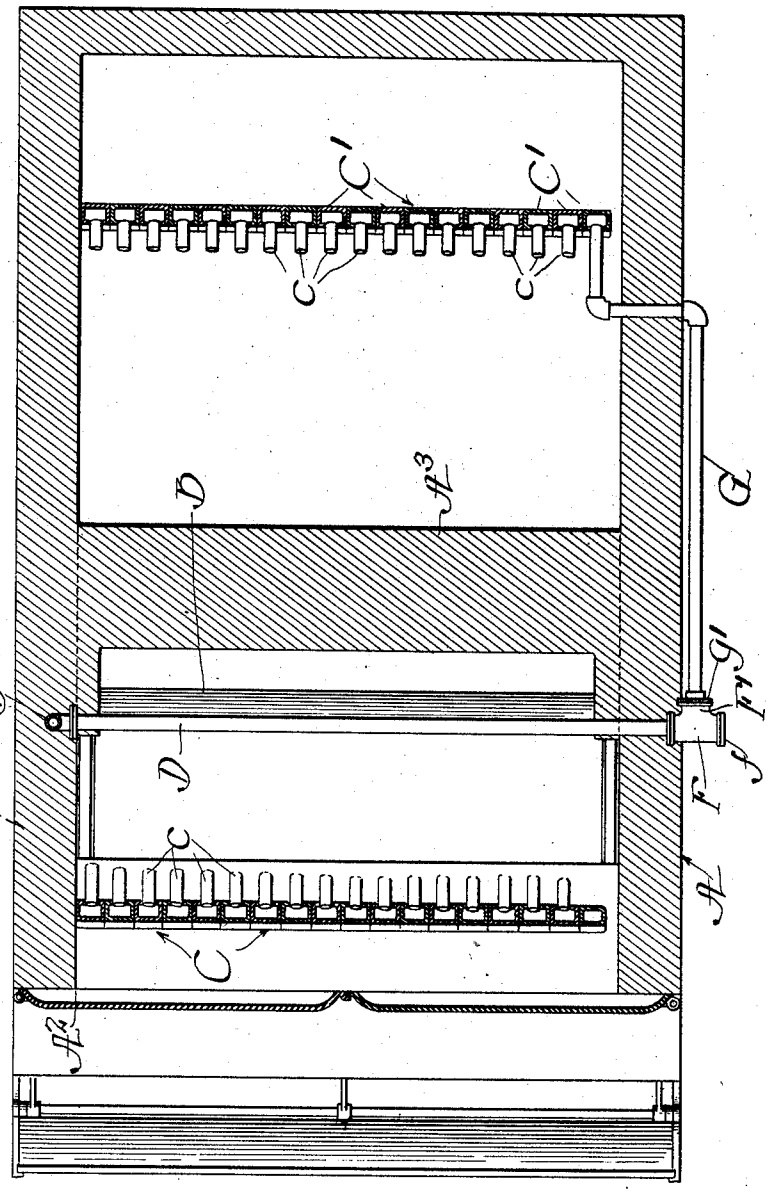
3 SHEETS—SHEET 2.

FIG. 2.



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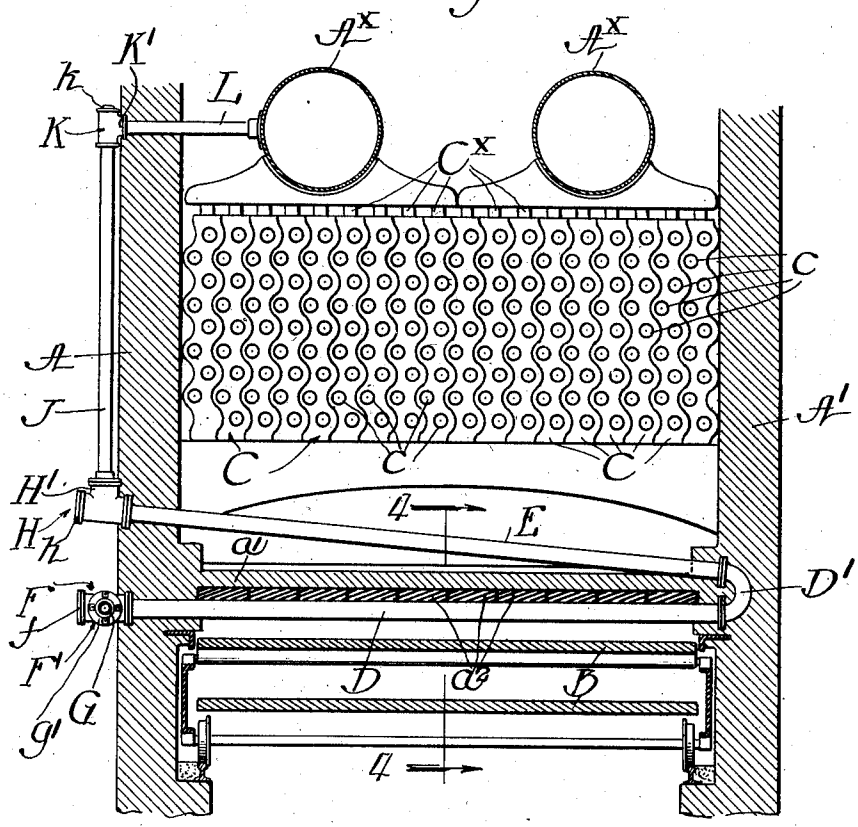
3 SHEETS—SHEET 3.

Fig. 3.



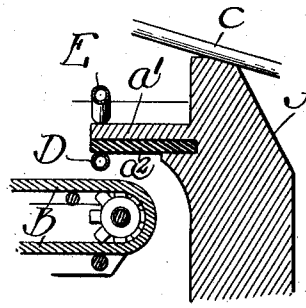


Fig. 4.

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UNITED STATES PATENT OFFICE.

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TRAVELING-GRATE FURNACE.

1,003,503. Specification of Letters Patent. **Patented Sept. 19, 1911.**

Application filed June 3, 1911. Serial No. 631,005.

To all whom it may concern:

Be it known that I, HERMAN A. POPPENHUSEN, a citizen of the United States, and a resident of Evanston, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Traveling-Grate Furnaces; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to means for closing the space between a layer of ashes resting upon the grate of an automatic stoking furnace and a part of the bridge wall of said furnace which overhangs the rear of the grate to prevent the passage of air between the rear end of the grate and the bridge wall and more especially to a water cooled, metal bridge piece or water back located forward of the bridge wall over the rear end of the grate.

The invention consists of the matters hereinafter described and more particularly pointed out in the appended claim.

In the drawings—Figure 1 is a view partially in side elevation and partially in longitudinal, vertical section, of a steam boiler furnace provided with a water back and connections made in accordance with my invention; Fig. 2 is a view representing a horizontal section through the boiler furnace in a plane indicated by the line 2—2 of Fig. 1; Fig. 3 is a transverse vertical section through the boiler furnace in a plane indicated by the line 3—3 of Fig. 1; Fig. 4 is a view representing a partial longitudinal section through the boiler furnace in a plane indicated by the line 4—4 of Fig. 3.

Referring now in detail to that embodiment of my invention illustrated in the drawings, A, A′ indicate the side walls of a steam boiler furnace, A^2, the front wall, and A^3, the bridge wall thereof.

A^4 indicates a fire arch or coking breast extending rearwardly from the front wall A^2.

B indicates a traveling chain grate of the usual construction by which the fuel is carried from the feed opening *a* in the front wall A^2 of the furnace rearwardly toward the bridge wall.

C indicates a set of front and C′ a set of rear headers of the water tube boiler; said front and rear headers being connected by means of water tubes *c* in the usual manner.

A^x, A^x, indicate longitudinally extending steam and water drums supported above the headers C, C′, and connected at their forward ends to the front headers C by pipes C^x and at their rear ends to the rear headers C′ by pipes C^y in a familiar manner. The bridge wall A^3 is provided with a forwardly extending horizontal portion *a′* overhanging the rear end of the chain grate B and constructed of tiles or fire bricks.

D indicates a horizontal metal pipe or tube extending transversely of the furnace over the rear end portion of the chain grate B. Said pipe is supported at its ends in the side walls A, A′ in contact with the overhanging part *a′* of the bridge wall so as to serve as a support for the same. Said tube D performs the function of the similarly located water cooled bridge pieces heretofore employed for like purposes, the same serving to close the space between the grate and the bridge wall against the passage of air. In other words, the said tube D is arranged at such a distance above the rear part of the grate that the part of the layer of fuel resting upon the rear part of the grate will be constantly in contact with the same, it being understood that the layer of ashes or burned out products of combustion carried rearwardly on the grate will pass beneath said tube, while at the same time continuous contact of the bottom of said tube with the top surface of said layer of ashes or burned out fuel will be maintained.

As shown in the drawings, the tube D affords direct support for horizontal tiles a^2 forming the lower part of the overhanging portion *a′* of the bridge wall. The rear ends of said tiles are embedded in the bridge wall and the forward ends thereof rest upon the top surface of said pipe, as clearly shown in Figs. 3 and 4.

E indicates a second inclined tube or pipe, which extends transversely of the furnace. The ends of said tube E are supported in the side walls A, A′, as in the case of the tube D and, in its part between said side walls, said tube E is exposed to the action of the heat within the furnace. At its lower or receiving end, at one side of the furnace, the tube E is connected by a circulating con-

nection, with the delivery end of the tube D. Said tube E, as shown in the drawings, is located in the same vertical plane with the tube D and extends above the overhanging part of the bridge wall, and the circulating connection between said tubes is formed by means of a curved tube section D′ which together with the adjacent ends of said tubes is embedded in the side wall A′, as shown in Fig. 3. At the opposite side of the furnace, the receiving end of the tube D is thus inserted into or embedded in the side wall A and has attached to it a T-fitting F which extends outwardly beyond the outer face of the said side wall A and is, as shown in the drawings, located mainly outside of said wall. The body of said fitting F constitutes an endwise extension of the tube D and its outer end is closed by a removable cap or head *f*. The body of said fitting F forms a straight extension of said tube D in order to give free access to the same, when the cap *f* is taken off, for the purpose of cleaning or inspecting the inside of said tube. The body of the fitting F is provided with a lateral extension or neck F′, with which is connected a water supply pipe G, by which a circulating connection is made between the tubes D and E and one of the rear headers C′ of the boiler. The connection between said pipe G and the fitting is afforded by means of a cap or plate *g*′, which is secured to the flanged end of said neck F′, and to which the forward end of the water supply pipe is attached. Said pipe G extends rearwardly from the fitting F, outside of the wall A of the furnace, and is provided with a transverse horizontal part which extends inwardly through said wall. The rear end portion of said pipe G is located inside of said wall A, and is connected with the lower part of one of the rear headers C′ of the boiler.

To the upper or delivery end of the tube E, which extends through the wall A, there is secured a T-fitting H, which forms an endwise extension of said tube E. The outer end of said fitting extends outwardly beyond the outer face of the wall A, the greater part of the body of said fitting lying outside of said wall, as in the case of the fitting F. Said fitting H is provided with a removable cap or head *h*. The body of the fitting H is provided with a lateral extension or neck H′, with which is connected a water return pipe J, by means of which circulating connection is made between said tube E and one of the steam and water drums A^x. The pipe J is connected at its upper end to a T-fitting K having a lateral extension K′, to which is connected a horizontal pipe L, which extends through the wall A and is connected to and opens into the said drum A^x. The fitting K is closed at its upper end by a removable cap *k*.

The front and rear headers C, C′, as usual in boilers of this kind, and as shown in the drawings, extend vertically and are arranged side by side. The circulating pipe G is connected with the lower end of the rear header C′, which is nearest the wall A; the end of said circulating pipe being inserted in a hole left for the purpose by the omission of the lowermost water tube extending between said headers. The corresponding opening in the forward header C is closed.

In the arrangement of the parts constructed as described, water from the rear boiler header C′ with which the supply pipe G is connected passes through said supply pipe G to the end of the tube D, thence passes through the tube D and from the same to and through the tube E and from the latter is delivered by the return pipe J to the steam and water drum A^x. In a tubular boiler of the character described, the circulation of water is in a forward direction through the water tubes *c* from the rear headers C′ to the front headers C and thence to the steam and water drums A^x. By the circulating connection described, a constant circulation of water is maintained through the tube D so as to keep the same at such a low temperature as to avoid any injury to or weakening of the same through the action of the great heat to which it is subjected.

The pipe E being inclined upwardly from its point of connection with the delivery end of the tube D, and being exposed to the heat within the furnace, tends to produce a rapid and certain circulation through said tubes; the water in the inclined tube being heated to a high temperature, rising through said tube and producing a continuous inflow from the rear header through the pipe G and the tube D, to said tube E, and a constant outflow from said tube E through the return pipe J to the upper part of the boiler. The pipe or tube E in effect constitutes an extension of the return pipe, which is exposed to the heated gaseous products of combustion in the furnace, and by reason of the fact that the supply pipe is located outside of the combustion chamber, said supply pipe is maintained at a much lower temperature than the inclined tube E, with the result of producing a rapid flow of water through the supply pipe to the said tube D, for water cooling the latter, and the rapid flow of water from the delivery end of said tube D, upward through said inclined tube E, notwithstanding the fact that the main return pipe J is located outside of the furnace and is not in itself subject to the heat within the same. Moreover, by reason of the connection of both the supply and main return pipes with the tubes D and E outside of the combustion chamber, the joints between said

pipes and the ends of the tubes are protected from the extreme heat within the furnace, and remain always at a moderate, or practically the same, temperature, and there will be no expansion and contraction of the parts such as would tend to injure the joints or result in leakage. Furthermore, an important advantage is gained by having the ends of the water cooled tubes D and E, with which the supply and return pipes are connected, located at the same side of the furnace, because the endwise expansion and contraction of the said tubes D and E, in this construction, may take place without producing any shifting or moving of the said tubes with relation to the supply and return pipes; it being obvious that in the construction illustrated, the ends of the tubes to which the supply and return pipes are attached, may be made fixed or immovable, so that any endwise expansion and contraction of the tubes will produce shifting movement of the tubes at their opposite or connected ends only. Furthermore, the construction by which the ends of the water-cooled member, to which the supply and return pipes are attached, are both located at one side of the furnace, affords this advantage that the device can be used equally well in connection with a double furnace, or two furnaces placed closely together side by side, as in connection with a single furnace; it being manifest that said ends of the tubes, through which access is gained to the same for the purpose of removing sediment and the like as well as the supply and return connections will, in such case, be located at and accessible from the outer side of each of the two furnaces.

I claim as my invention—

The combination with the side walls and bridge wall of the furnace, of a grate adapted to effect movement of the fuel resting thereon rearwardly in the furnace, said bridge wall being provided with a part which overhangs the rear end of said grate, a tube which extends across the furnace and is located beneath and in supporting engagement with the overhanging part of the bridge wall, a second tube extending across the interior of the furnace, said second tube being inclined upwardly from its receiving end, and the receiving end of said inclined tube being connected with the delivery end of the first-named tube at one side of the furnace by a circulating connection, a supply pipe located in a space subject to a substantially lower temperature than that within the furnace and connected with the receiving end of the first-named tube exterior to the inner surface of the said side wall and a return pipe connected with the delivery end of the inclined tube at a point exterior to the inner surface of the said side wall of the furnace.

In testimony that I claim the foregoing as my invention I affix my signature in the presence of two witnesses, this 1st day of June A. D. 1911.

HERMAN A. POPPENHUSEN.

Witnesses:
TAYLOR E. BROWN,
GEORGE R. WILKINS.