H. J. GEBHARDT.

WATER TUBE BOILER.

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1,285,677. Patented Nov. 26, 1918.

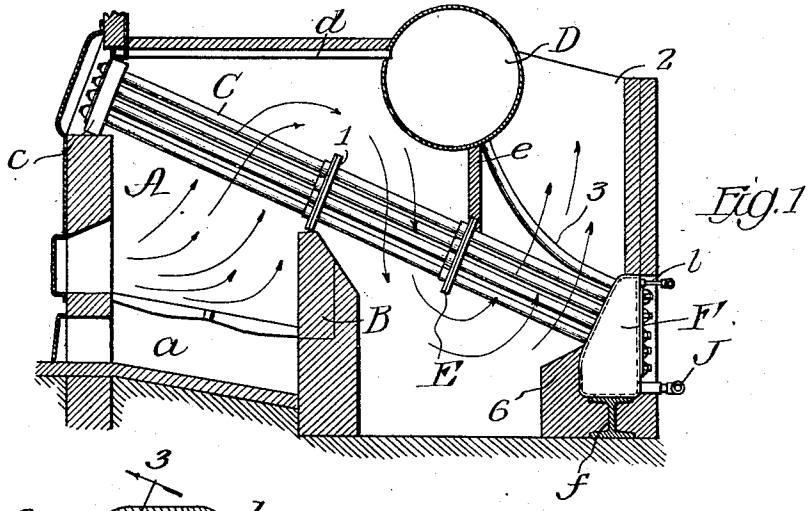


Fig. 1

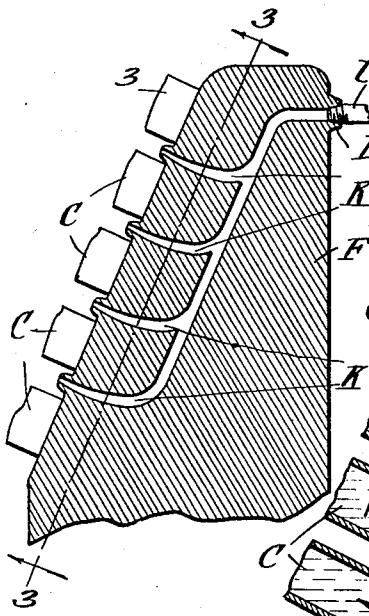


Fig. 4.

Fig. 2.

Fig. 3.

Witness:
H. B. Barrett

Inventor
Henry J. Gebhardt
By Arthur H. Durand
Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HENRY J. GEBHARDT, OF CHICAGO, ILLINOIS.

WATER-TUBE BOILER.

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To all whom it may concern:

Be it known that I, HENRY J. GEBHARDT, a citizen of the United States of America, and resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Water-Tube Boilers, of which the following is a specification.

My invention relates to boilers of that kind in which the water is circulated through tubes which are connected together at their ends by headers. In boilers of this kind, it has heretofore been the practice to admit the water at the top of each header, and to allow the water to escape through tubes connected to one side wall of the header. In such case, it has also been the practice to connect a mud-drum to the bottom of each header.

Generally stated, the object of my invention is to provide an improved construction and arrangement which will obviate the use of said mud-drum, and which will materially reduce the cost of manufacture, without in any way lessening the efficiency of the boiler.

More specifically stated, the object of my invention is to provide a combined header and separator which will be entirely sufficient and which will take the place of the header and separate mud-drum heretofore employed in boilers of this kind.

A further and special object of my invention is to provide an improved construction and arrangement whereby a water-tube-header may be provided with means for blowing the soot and dust off from the tubes.

It is also an object of my invention to provide certain details and features of construction and combinations tending to increase the general efficiency and desirability of a water-tube-header of this particular character.

To the foregoing and other useful ends, my invention consists in matters hereinafter set forth and claimed.

In the accompanying drawings:—

Figure 1 is a longitudinal section of an ordinary water-tube boiler provided with a rear header embodying the principles of my invention.

Fig. 2 is an enlarged vertical section of said header, the section being taken in a plane parallel with the water tubes.

Fig. 3 is a section on line 3—3 of Fig. 4, showing one of the headers in cross-section.

Fig. 4 is a vertical section on line 4—4 in Fig. 3.

As thus illustrated, the furnace comprises a combustion chamber A having a grate *a* and a bridge-wall B of any suitable character. The water tubes C are inclined downwardly at their rear ends, the front header *c* being supported on the front wall of the furnace, and the first baffle-plate 1 being supported on the upper edge of the bridge-wall. The transverse drum D is supported in any suitable manner, and is connected by a pipe *d* with the front header *c* in the usual and well-known manner. The second baffle-plate E serves in conjunction with the wall *e* to cause a downward movement of the products of combustion through the second pass of the boiler, and then upward through the third pass to the opening 2 which leads to the stack of the furnace. At their lower and rear ends, the water tubes C are connected together by means of a header F which rests on an I-beam *f* in the masonry of the furnace. The tube 3 leads downward from the drum D to the uppermost portion of the inner wall of the header F, at a point just above the uppermost tube C, so that this tube 3 is also subjected to the heat of the products of combustion moving upward through the third pass of the boiler.

The header F is of a novel form and is constructed as follows: The inner wall 4 of said header is inclined to extend at right angles to the tubes, but the outer wall 5 is substantially vertical. In this way, the base of the header is enlarged to form a mud-chamber G in which the mud and other impurities in the water may settle and come to rest. The water enters the top of the header from the pipe 3 at a temperature which is much less than the temperature of the water which is leaving the header through the tubes C, as the latter are nearest to the fire, and for the further reason that the wall 4 is directly exposed to the heat. As the wall 5 is away from the heat, the water entering the top of the header will descend near the wall 5, which is cooler than the inclined inner wall of the header, and the water, after becoming heated, will rise and be deflected into the tubes C by the baffle-plates H, it being observed that these baffle-plates are inclined so that their lower edges are just in line with the tops of said tubes. In this way, the said baffle-plates or deflectors do not interfere with the free access to the tubes through the hand-holes I provided for this purpose in the outer wall of the header. It will be understood that these hand-holes are

provided in the usual manner with removable covers of any suitable character. The mud-chamber G, it will be seen, is immediately below the lowermost deflector or baffle-plate *h*, which latter extends a little farther toward the wall 5 of the header than the others. The plates H and *h* in effect form compartments between them leading to the inlet openings of the tubes. A blow-off pipe J is suitably connected with an opening in the lower portion of the wall 5, so that the accumulation in the chamber G may be discharged therefrom. The lower portion of the inner wall 4 is covered by the masonry 6, so that the mud-chamber G is protected from the heat, thus making the said wall above this chamber the hottest portion of the header, which is essential to the proper circulation of the water from the tube 3 into the header and then out through the tubes C, in a manner that will be readily understood. In this way, it will be seen that the header F, which can be constructed in any suitable manner, either by casting it or forming it from sheet-metal, serves also as a means for precipitating the impurities in the water, the base of the header itself forming a mud-chamber. Consequently, no separate mud-drum is necessary, and thus the cost of manufacture is materially reduced.

It will be understood that the header F can be of any suitable or desired width. For example, it can be just wide enough to accommodate one row of tubes extending up and down thereof, and in such case a number of these headers will be arranged side by side in the usual and well-known manner. With this construction, one side of each header may be provided, in any suitable or desired manner, with passages K provided with nozzles *k* arranged in position to blow steam between the tubes 3 and C, (see Figs. 2, 3 and 4 in which the passages are shown formed in the side of one of the headers, the other headers being similar. In Fig. 4, the tubes 3 and C are, of course, on the next header-section which is similar to the one shown in Fig. 3, the two sections, and the other sections, being arranged side by side), thereby to remove the soot and dust from the tubes. For this purpose, these passages K are connected with a boss L on the outer wall of the header, at the upper end of said wall, and a supply-pipe *l* is connected with said boss. This pipe *l* can be connected in any suitable manner with the source of steam pressure, whereby steam may be blown through all of the passages at the same time. When dry steam is blown through these passages K in the sides of the headers, and allowed to escape through the nozzles *k*, the soot and dust will be removed from the tubes. With this construction, the steam-connections to the header-sections are permanent, and the passages K are never open at their outer ends to the atmosphere, but are always closed in this respect.

With further respect to the combined header and separator F, it will be understood that the water entering from the pipe 3 is at a temperature of substantially three hundred degrees Fahrenheit, or over, so that the lime and other minerals which have been previously held in solution are reduced to small particles which are held in suspension in the water, and which are precipitated between the wall 5 and the lower edges of the baffle-plates or deflectors H and *h*, and into the chamber G at the bottom of the header. In other words, these particles of matter have a tendency to seek the cool side of the header, and every time the water moves downward and passes up under one of the baffle-plates H the particles of matter are precipitated to the bottom of the header, instead of following the outward flow of the water through the tubes. Preferably, the baffle-plates H have their edges different distances away from the wall 5, the upper plate being the farthest away and the lower plate being the nearest to said wall, so that the downward passage formed at the rear of the header is somewhat contracted at its lower end, the upper end of this passage having substantially the same or even a greater capacity than the tube 3, so that the circulation through the header will be of the desired character as desired. The plates H and *h* cause the incoming and descending water to hug the outer wall 5 of the header.

With the construction shown and described, therefore, the blower for cleaning the soot and dust from the water tubes is incorporated in the structure of the header, each section of the header having only a single steam connection for the several passages and nozzles thereof, whereby an external steam-pipe connection for each nozzle is not necessary.

What I claim as my invention is:—

1. A water-tube-boiler comprising a header having inlet and outlet openings in the inner side thereof, tubes for said openings to circulate the water through said header and means forming compartments in the header to divert the outgoing water to said outlet openings, the base of the header itself forming a settling chamber, and a blow-off for the outer side of said chamber at the bottom thereof.

2. A water-tube-boiler comprising a header having inlet and outlet openings in the inner side thereof, and tubes for said openings to circulate the water through said header, the base of said header forming a chamber, the inner wall of said header above said chamber being exposed to the heat, means to cover the lower portion of said wall, the outer wall of said header being vertical,

hand-hole closures for said outer wall, each closure being in line with one of said tubes, a blow-off for said chamber, and inclined baffle-plates in said header to keep the descending water near the outer wall and deflect the rising water into the outlet tubes, said inner wall being inclined toward the outer wall, and said chamber being under the lowest baffle-plate.

3. A water-tube-boiler comprising a header having inlet and outlet openings in the inner side thereof, and tubes for said openings to circulate the water through said header, the base of said header forming a chamber, and inclined baffle-plates in said header to keep the descending water near the outer wall and deflect the rising water into the outlet tubes, said chamber being immediately below the lowest baffle-plate.

4. A water-tube-boiler comprising a header having inlet and outlet openings in the inner side thereof, tubes for said openings to circulate the water through said header, the base of the header itself forming a chamber, the lower portion of said header being enlarged to form said chamber, and means to cover the lower portion of said inner side to keep the contents of said chamber relatively cool, said inner side above said chamber being exposed to the heat and inclined toward the outer side, said outer wall being substantially vertical and away from the heat, and a baffle plate leading downward from said inner side over said chamber and stopping short of the outer side to form the entrance to said chamber.

5. A water-tube-boiler comprising a header having inlet and outlet openings in the inner side thereof, tubes for said openings to circulate the water through said header, the base of the header itself forming a chamber, means in said header to keep the descending water near the outer wall of said header and cause the rising water to enter the outlet tubes, said inner side being exposed to the heat, said outer wall being disposed away from the heat to remain relatively cool, means to deflect the water into said tubes, and means to protect said chamber from the heat.

6. A water-tube-boiler comprising a header having inlet and outlet openings in the inner side thereof, tubes for said openings to circulate the water through said header and means forming compartments in the header to divert the outgoing water to said outlet openings, the base of the header itself forming a settling chamber, said tubes being inclined to extend downwardly to said openings, said inner side being substantially at right angles to said tubes, and the outer wall of said header being vertical and having hand-holes in line with said tubes.

7. In a water-tube-boiler, a combined header and separator for connecting together the ends of tubes, and for separating the impurities from the water and precipitating the same to the bottom of the header, and a blow-off for the outer side of said header at the bottom thereof, said header having interior deflecting means to cause the incoming and descending water to hug the outer wall of said header.

8. In a water-tube-boiler, a header for connecting together the ends of the tubes, and means associated with said header to blow steam between the tubes to remove soot and dust therefrom, said header being made in sections, and said means including passages formed in the sides of the sections, and means whereby steam may be blown through all of said passages at the same time, including only a single permanent steam connection to each section.

9. In a water-tube-boiler, a header for connecting together the ends of the tubes, said header being formed on its inner side with jet-openings to blow steam between the tubes to remove the soot and dust therefrom, said header being formed with passages leading to said openings, said header being formed with a permanent steam-inlet which is common to said passages, so that said passages are always closed to the atmosphere at their outer ends, and means for supplying steam to said steam-inlet, whereby the steam passes through the header in direct contact therewith.

Signed by me at Chicago, Illinois, this 4th day of August, 1916.

HENRY J. GEBHARDT.

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