(No Model.)

J. K. RUGG.

STEAM BOILER FURNACE.

No. 490,454. Patented Jan. 24, 1893.

FIG. 1.

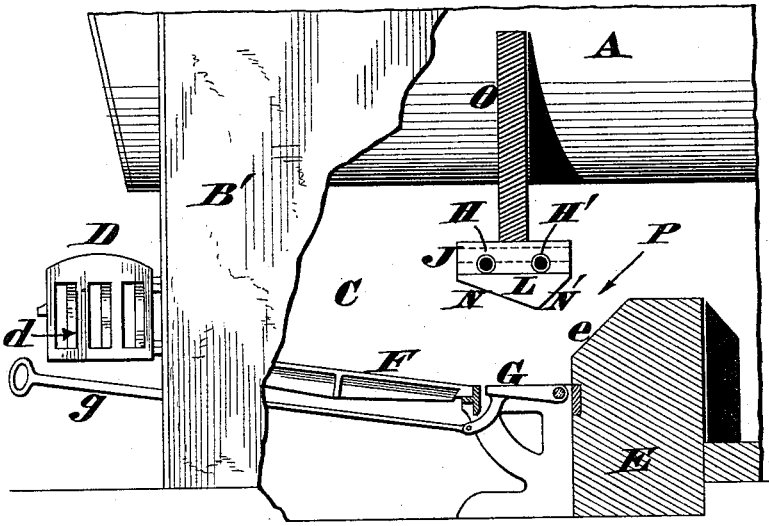


FIG. 2.

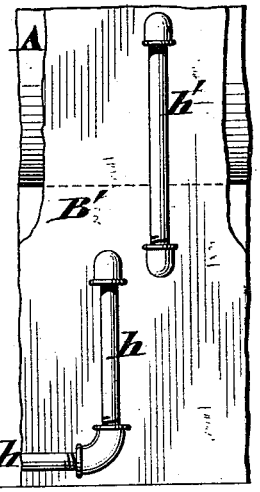


FIG. 3.

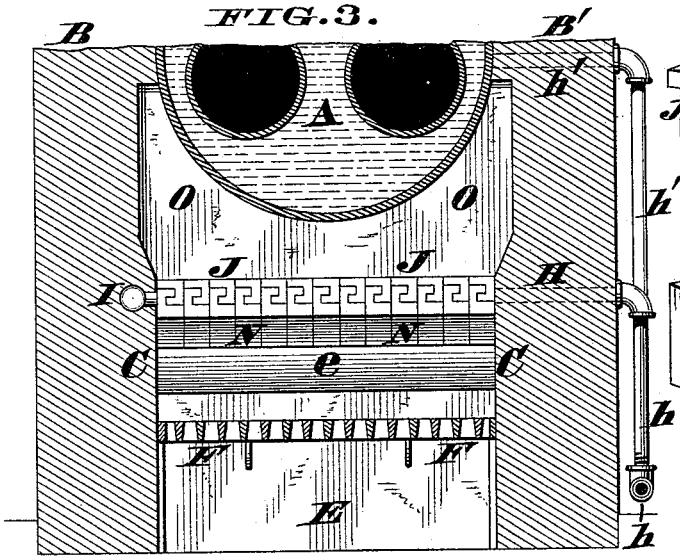


FIG. 5.

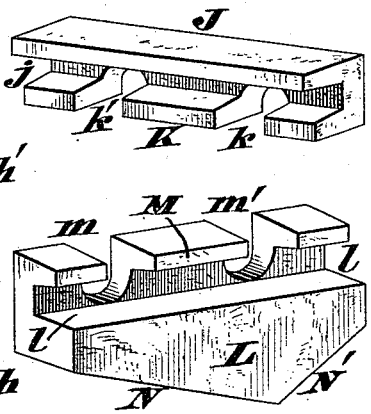
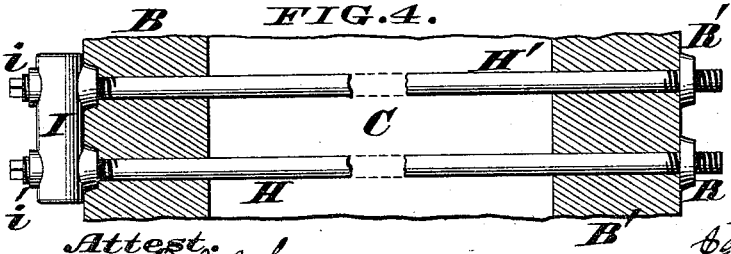


FIG. 4.



Attest.
D. J. Johnson.
Jas. L. Smith.

Inventor.
Joseph K. Rugg.
by James F. Leyman.
Atty.

UNITED STATES PATENT OFFICE.

JOSEPH K. RUGG, OF CINCINNATI, OHIO.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 490,454, dated January 24, 1893.

Application filed October 10, 1892. Serial No. 448,374. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH K. RUGG, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Steam-Boiler Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, reference being had to the annexed drawings, which form part of this specification.

My invention consists in constructing the hanging-bridge of a steam-boiler furnace in such a manner as to enable a convenient renewal of the part exposed to the most intense heat, and therefore, the most liable to burn out by constant use. To accomplish this result, the extreme lower portion of the bridge is composed of a series of interlocking slabs or tiles made of fire-clay or other refractory material or materials, and each tile consists of an upper and lower section capable of being hung upon suitable supports arranged across the furnace at any proper elevation. These tile sections must be so shaped and adapted to engage with each other as to permit their being inserted and removed laterally of the furnace, and said supports usually consist of a pair of pipes that communicate with the water space of the boiler, although one of said pipes may connect with a feed-pump, for the purpose of establishing a forced circulation. Furthermore, these tiles are so shaped as to co-act with the grate and bridge-wall in causing a complete combustion of fuel, without producing a dense cloud of smoke, as hereinafter more fully described.

In the annexed drawings,—Figure 1 is a sectionized side elevation of a steam-boiler furnace embodying my improvements. Fig. 2 is a side elevation of that portion of the furnace wall where the pipe connections are made. Fig. 3 is a transverse section of the furnace taken directly in front of the hanging bridge and looking rearward. Fig. 4 is an enlarged horizontal section of a modified form of the pipes that support the hanging bridge. Fig. 5 is a perspective view of two interlocking slabs or tiles separated from each other.

A represents the front, lower portion of any approved form of steam boiler, and B B′ are side walls inclosing the same.

C is the furnace space, and D a fire door thereof, which door may have a register *d*, to regulate the admission of air.

Extending completely across the rear of the furnace space, and carried up as high as may be necessary, is a bridge-wall E, the most exposed portion of which, *e*, is beveled off at an angle of forty-five degrees.

F represents a stationary grate, inclining rearwardly, and G is a dump grate at the back of the furnace, which grate G, can be agitated at any time by the lever *g*.

H, H′, are two metallic pipes secured across the furnace at a suitable distance in front of and above the bridge wall E, the ends of said pipes being screwed into a manifold I embedded in the side wall B.

h, *h*, are external pipes coupled to the exposed end of pipe H, and communicating with a pump or other boiler feeder. *h′*, *h′*, are other external pipes coupled to the exposed end of the pipe H′, and communicating with the boiler A.

The main pipes H, H′, serve as supports for the sectional hanging-bridge, previously alluded to, and each section is preferably composed of two parts, the peculiar shape of which is more clearly seen in Fig. 5. Here, J represents the upper part, and *j* is a longitudinal groove in one side of the same. K is a longitudinal tongue at the bottom of said part, and *k*, *k′*, are transverse notches in the same. L represents the lower part of a section, and *l* is a longitudinal groove in one side thereof. M is a longitudinal tongue in the top of said part, and *m m′*, are transverse notches made therein. Furthermore, the bottom of this lower section L, slopes in two opposite directions, as at N N′, the rear slope N′ being about parallel with the beveled front *e* of the bridge wall E. As previously stated all the sections of the hanging bridge must be tiles or slabs made of fire clay or other refractory material or materials capable of resisting the intense heat of a boiler furnace.

O is a partition wall, built upon the hanging bridge, and extending from the wall B to the opposite wall B′, as seen in Fig. 3.

P is a contracted throat between the hanging bridge and bridge wall, and serving as the only outlet to the furnace. After the pipes H H′, have been properly fitted within

the walls B B′, it is immaterial whether the act of applying the tiles or slabs to said pipes be commenced on the right or left side of the furnace, but for the purpose of illustration, I will suppose the hanging bridge is to start from the wall B. In this event, the lower section of a slab is first brought to bear against the wall in such a manner as to cause the pipes H, H′, to enter the respective notches *m*, *m′*, of said slab, and then the upper section is applied to said pipes. When thus applied, the pipes enter the respective notches *k*, *k′*, of said section which latter is then slid toward the wall B, thereby causing the tongues and grooves of the upper and lower sections to interlock with each other in the manner shown in Fig. 3. These acts are continued until all the sections are in place, a little space being left in the wall B′ to enable the ready application of the last slab, which space is subsequently built in with brick and mortar. In some cases, however, the upper section can be made in two parts, and one half can be slipped in from the front, while the other half is applied from the rear, thereby dispensing with the special space in said wall. But if the hanging bridge is started from the other wall B′, the upper section must be first applied and the lower section engaged with it. After the hanging bridge has thus been formed, the partition wall O is built upon it, so as to connect the side walls B B′, and completely close the space between said bridge and boiler. Consequently, when a fire is started in the furnace, the products of combustion can escape only through the throat P. After the coal has burned sufficiently to give off all its smoke producing properties and been reduced to the condition of coke, it is shoved back from the grate F onto the rear grate G, where the coke soon becomes an incandescent mass. Therefore, when fresh coal is again supplied to the front grate, the dense smoke and gases generated within the furnace are compelled to traverse the outlet P, being thereby subjected to the intense heat radiated from the incandescent fuel and from the red hot surfaces *e* N N′, the result being a thorough combustion of said smoke and gases. Furthermore, as this complete combustion is effected without introducing live steam into the furnace, as is the case with many smoke consumers, the capacity of the boiler is not diminished, neither does it require constant attention on the part of the engineer or fireman.

When the furnace is in operation, the feed pump is forcing a constant stream of water through the pipes H, H′, and their connections, which positive current prevents an accumulation of sediment or other obstructions within them, and keeps said pipes comparatively cool. In case either of the tiles should crack or burn out, a new one can be readily applied after removing one or two of the adjacent tiles and detaching a few bricks, the other portion of the bridge remaining undisturbed.

The above is a description of the preferred form of my invention, but with some boilers it may be necessary to locate the hanging bridge in the rear of the bridge wall, while in other cases two or more of such hanging bridges may be employed. Or, the invention may be further modified, as seen in Fig. 4, where the manifold I is applied externally of the furnace wall and has a pair of screw plugs *i*, *i′*, the detachment of which will enable the ready cleaning of the pipes H H′, and by providing them with collars R R′, said pipes will serve as ties to prevent springing of the furnace walls.

In this specification where the expression "laterally-shiftable interlocking-sections" occurs, it is to be understood as defining slabs or tiles which are capable of being fitted together or disengaged from each other when shifted toward either side of the furnace, and said expression is not designed to include any part of a furnace that can be moved from front to rear of the same. Neither is this expression designed to include vertically-shiftable tile-sections.

I claim as my invention.

1. A steam-boiler furnace having a hanging-bridge supported upon a series of laterally-shiftable interlocking-sections carried by pipes communicating with the water space of a boiler, substantially as herein described, and for the purpose set forth.

2. A steam-boiler furnace having a hanging-bridge supported upon a series of laterally-shiftable interlocking-sections carried by a pair of pipes, one of which enters the boiler, while the other pipe is adapted to communicate with a pump, substantially as herein described.

3. A sectional slab or tile for a hanging bridge, which slab consists of an upper part J having a longitudinal groove *j*, longitudinal tongue K, and transverse notches *k*, *k′*, and a lower part L, having a longitudinal groove *l*, longitudinal tongue M, and transverse notches *m*, *m′*, all as herein described.

4. In a steam-boiler furnace, the pipes H, H′, connected at one end to the manifold I, and having collars R, R′, screwed to their other end, said pipes being in communication with the water space of the boiler, for the purpose described.

5. A steam-boiler furnace having a hanging-bridge built upon a series of laterally-shiftable interlocking-sections carried by suitable supports, substantially as herein described.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH K. RUGG.

Witnesses:
JAMES H. LAYMAN,
FRANK H. KINNEY.